S. Hrg. 99-596, Pt. 2

ENERGY AND WATER DEVELOPMENT APPROPRIATIONS FOR FISCAL YEAR 1987

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE

COMMITTEE ON APPROPRIATIONS

UNITED STATES SENATE

NINETY-NINTH CONGRESS

SECOND SESSION

ON

H.R. 5162

AN ACT MAKING APPROPRIATIONS FOR ENERGY AND WATER DEVELOPMENT FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1987, AND FOR OTHER PURPOSES

PART 2 (Pages 583-1375)

DEPARTMENT OF ENERGY

Printed for the use of the Committee on Appropriations

U.S. GOVERNMENT PRINTING OFFICE
57-567 O WASHINGTON : 1986

For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

S181-40

57-567 O—86——1

COMMITTEE ON APPROPRIATIONS

MARK O. HATFIELD, Oregon, *Chairman*

TED STEVENS, Alaska
LOWELL P. WEICKER, JR., Connecticut
JAMES A. McCLURE, Idaho
PAUL LAXALT, Nevada
JAKE GARN, Utah
THAD COCHRAN, Mississippi
MARK ANDREWS, North Dakota
JAMES ABDNOR, South Dakota
ROBERT W. KASTEN, JR., Wisconsin
ALFONSE M. D'AMATO, New York
MACK MATTINGLY, Georgia
WARREN RUDMAN, New Hampshire
ARLEN SPECTER, Pennsylvania
PETE V. DOMENICI, New Mexico

JOHN C. STENNIS, Mississippi
ROBERT C. BYRD, West Virginia
WILLIAM PROXMIRE, Wisconsin
DANIEL K. INOUYE, Hawaii
ERNEST F. HOLLINGS, South Carolina
LAWTON CHILES, Florida
J. BENNETT JOHNSTON, Louisiana
QUENTIN N. BURDICK, North Dakota
PATRICK J. LEAHY, Vermont
JIM SASSER, Tennessee
DENNIS DECONCINI, Arizona
DALE BUMPERS, Arkansas
FRANK R. LAUTENBERG, New Jersey
TOM HARKIN, Iowa

J. KEITH KENNEDY, *Staff Director and Clerk*
REBECCA M. DAVIES, *Deputy Staff Director*
FRANCIS J. SULLIVAN, *Minority Staff Director*

SUBCOMMITTEE ON ENERGY AND WATER DEVELOPMENT

MARK O. HATFIELD, Oregon, *Chairman*

JAMES A. McCLURE, Idaho
JAKE GARN, Utah
THAD COCHRAN, Mississippi
JAMES ABDNOR, South Dakota
ROBERT W. KASTEN, JR., Wisconsin
MACK MATTINGLY, Georgia
PETE V. DOMENICI, New Mexico

J. BENNETT JOHNSTON, Louisiana
JOHN C. STENNIS, Mississippi
ROBERT C. BYRD, West Virginia
ERNEST F. HOLLINGS, South Carolina
QUENTIN N. BURDICK, North Dakota
JIM SASSER, Tennessee
DENNIS DECONCINI, Arizona

Professional Staff

STEPHEN L. CROW
W. DAVID GWALTNEY
W. PROCTOR JONES (Minority)

CONTENTS

TUESDAY, MARCH 4, 1986

Department of Energy: Page
Office of the Secretary 583

TUESDAY, MARCH 11, 1986

Department of Energy:
Solar and renewable energy programs 675
Environment, safety, and health 823

THURSDAY, MARCH 13, 1986

Department of Energy:
Nuclear fission R&D, uranium enrichment, and nuclear waste disposal programs 901

THURSDAY, MARCH 20, 1986

Department of Energy: Power Marketing Administrations 1051
Bonneville Power Administration 1059
Southeastern Power Administration 1102
Southwestern Power Administration 1117
Alaska Power Administration 1137
Western Area Power Administration 1147

WEDNESDAY, APRIL 23, 1986

Department of Energy:
Naval Nuclear Propulsion Program 1197
Atomic energy defense activities 1223

ENERGY AND WATER DEVELOPMENT APPROPRIATIONS FOR FISCAL YEAR 1987

TUESDAY, MARCH 4, 1986

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 2:07 p.m. in room SD–192, Dirksen Senate Office Building, Hon. Mark O. Hatfield (chairman) presiding.

Present: Senators Hatfield, Abdnor, Kasten, Mattingly, and Domenici.

DEPARTMENT OF ENERGY

OFFICE OF THE SECRETARY

STATEMENT OF JOHN S. HERRINGTON, SECRETARY OF ENERGY

ACCOMPANIED BY MARTHA O. HESSE, ASSISTANT SECRETARY, MANAGEMENT AND ADMINISTRATION

OPENING REMARKS

Chairman HATFIELD. The committee will please come to order.

This afternoon, we begin our examination of the fiscal year 1987 budget request for the Department of Energy.

As our first witness, we want to extend a very special welcome to Secretary of Energy, Mr. John Herrington.

Mr. Secretary, we look forward to your overview of the budget and the opportunity to raise questions with you. Following Secretary Herrington, we will then hear from Ms. Martha Hesse, the Assistant Secretary for Management and Administration.

Mr. Secretary, your entire statement will be placed in the record. You may proceed to highlight or summarize as you may wish.

SUMMARY OF STATEMENT

Secretary HERRINGTON. Thank you, Mr. Chairman. I am pleased to have the opportunity to present the Department's fiscal year 1987 budget to you today, and I would like to put my full statement into the record, if I could, please, and have a few brief opening remarks at this time.

Pulling this budget together at the Department of Energy has been a difficult task because of the Gramm-Rudman restraints that we face, the series of sharply reduced targets that we need to meet for 1991 when our deficit is to be reduced to zero. What we have attempted to accomplish is what I think is a very worthy goal, and to finish the job, we intend to work carefully with Congress and the administration. It is going to take a lot of courage and a lot of will on both our parts.

BUDGET SUMMARY

The President has kept his end of Gramm-Rudman by proposing this budget. If accepted, it will bring the deficit down to the 1987 target of $144 billion. The energy portion of that budget is $12.1 billion. That is about 1 percent above the fiscal year 1986 levels as adjusted for the sequestering order issued February 1.

We refer to our budget as lean, sharply focused, and fair. It provides sufficient funds for defense functions to meet the requirements levied on us by the Department of Defense, and it provides adequate funds for all essential activities in the general science and mission areas.

This budget applies Federal funds where they are most needed, for example, to remove technological barriers to increase the use of this Nation's vast energy resources; to continue measured development of possible energy technology for the future; to pursue the safe disposal of nuclear waste; to continue our research into the fundamental constituents of matter and energy and the basic forces of nature; and to improve the safety and security of the environment.

PRIVATIZATION PROPOSAL

There are some special initiatives in this budget that I want to mention specifically. First, the budget proposes privatization of the Naval Petroleum Reserves and defederalization of the Power Marketing Administrations. Taking the Naval Petroleum Reserves first, there is no national security reason at this time for the Government to continue to retain the Naval Petroleum Reserves. The Strategic Petroleum Reserve can pump oil out today 30 times faster than we can at the Naval Petroleum Reserve.

In our defense area, we meet our fuel needs primarily today from the open market, not from the Naval Petroleum Reserves. The sale, if accomplished, obviates the need for Federal funds for increasingly expensive secondary oil recovery. As you know, the field is declining these days and we are spending more and more on recovery.

Taking the Power Marketing Administrations, the proposal by the administration to sell those entities, to defederalize them, is justified on the basis that they do not serve a uniquely Federal purpose. They could be run equally or more efficiently by nonfederal organizations. And, as regional entities, they would be subject to regional control.

At the same time, we are proposing selling or privatizing the Power Marketing Administrations, we are also proposing legislation to reform their Federal investment repayment practices.

As we stated last year, we are using the legislative vehicle on this instead of an administrative program. And we are proposing the continued use of existing interest rates for repayment versus the current market rates, as proposed last year.

Next, the budget proposes a moratorium on further development of the Strategic Petroleum Reserve and a cessation of fill later this year, when 500 million barrels of crude oil will be in storage. The Strategic Petroleum Reserve represents a wholly adequate oil security insurance policy, given current oil market situations for the foreseeable future.

The moratorium should be reassessed as economic conditions and world oil market conditions change.

This budget strongly supports important initiatives announced last year to improve the safety, security, and environmental protection and cleanup of the Department's facilities. Enhanced attention to these issues is one of my highest priorities and a management requirement for all organizational levels of the Department.

We will try to leverage scarce Federal funds for research and development by taking minority positions with industry in cooperative technology transfer, research, and development consortia.

COOPERATIVE RESEARCH AND DEVELOPMENT EFFORTS

Cooperative research and development ventures in industry will not only increase the impact of our Federal funds by multiplying their effect, but it will also improve the technology transfer. In fiscal year 1987, our Fossil Energy Program will undertake a cooperative research and development venture pilot program, while conservation and solar programs will investigate the possibility of conducting partnership programs with industry.

A significant feature of this budget compared to fiscal year 1986 is the withdrawal of further Federal support for conservation grant programs. The States are recipients of very large sums received in restitution for oil pricing and allocation violations. These sums are available for conservation activities, and additional Federal funding is unnecessary.

In conclusion, Mr. Chairman, this budget builds a foundation of energy stability and security which we have laid during the past 5 years. It will move us another step closer to our goal of energy strength.

Thank you. I will be pleased to answer any questions of the committee at this time.

[The statement follows:]

STATEMENT OF JOHN S. HERRINGTON, SECRETARY OF ENERGY

Mr. Chairman and Members of the Committee, I appreciate the opportunity to present the FY 1987 budget for the Department of Energy. This budget supports the major themes of this Administration and is fully responsive to the requirements of the historic Gramm-Rudman-Hollings Balanced Budget and Emergency Deficit Control Act. It is a lean, trim, and sharply focused budget, which provides adequate funds for essential activities in the Department's three primary mission areas of Energy, General Science, and Defense. Before discussing details of the budget itself, I would like to describe the current energy situation and the Department's policy and budget initiatives.

CURRENT ENERGY SITUATION

Energy problems are no longer a destabilizing force in the national life and economy. The attempts by the OPEC cartel to limit production and control prices have failed. Real crude oil prices are down some 40 percent since early 1981, and are projected to decline further. The Nation is using its energy supplies more efficiently than ever before. Total U.S. energy production for the past two years has been at record high levels, and net oil imports are one-third less than they were in 1980.

This greatly reduced level of imports, the excess oil production capacity worldwide, and the almost 500 million barrels of crude oil in our Strategic Petroleum Reserve, serve to reduce substantially the likelihood of a major supply disruption.

Nevertheless, despite the favorable current situation we must not become complacent. We must use this respite to plan for a strong, secure energy future in an atmosphere of calm resolve.

POLICY AND BUDGET INITIATIVES

The Administration's overall energy goal is an adequate supply of energy at a reasonable cost. We can achieve that goal through the combination of energy stability, energy security, and energy strength. Energy stability has been achieved over the past five years. Our energy security is growing stronger day by day. Our objective for the immediate future is to build this Nation's energy strength, making full use of its vast natural resources and the daring and ingenuity of its citizens. Our approach includes removing technological and institutional barriers to increased use of coal and nuclear power, opening the Outer Continental Shelf to responsible hydrocarbon production, and eliminating the remaining price controls on natural gas. At the same time, we will continue to support advances in conservation as well as possible energy sources of the future such as magnetic fusion.

Some of these initiatives require budgetary resources, but many do not. The President's decontrol of oil in January 1981, required only the stroke of a pen, yet nothing has done more to put this Nation back on the right energy track. Reforming the nuclear licensing process and permitting all gas to sell at market rates would have a negligible budgetary impact, but would have immense, long-lasting benefits. Federal funding for appropriate activities can help us to reach our energy goal, but Federal funds are in short supply.

Deficit reduction is perhaps the preeminent domestic economic imperative today, and the Department fully recognizes that fact. For this reason, we are doing all we can to concentrate increasingly scarce resources on those programs and projects that directly fulfill a responsibility of the Federal government and truly require Federal assistance. If we are to achieve our overriding goal of deficit reduction we cannot afford to continue to allocate scarce Federal resources to activities where the rationale for continued Federal involvement is weak, and where State and local organizations or private industry can and should take over responsibilities presently borne by the Federal government. Also, we cannot permit programs or projects to continue with Federal support unless they meet a high priority national need.

These policies are evident in the FY 1987 budget for the Department of Energy. Among the major initiatives are the privatization of the Federal interest in Naval Petroleum Reserves No. 1 and No. 3 and the defederalization of the Power Marketing Administrations. There is no national security reason for the government to continue to run the Naval Petroleum Reserves today, almost seventy five years after they were established. They have not been true reserves since 1976, when Congress determined that the Reserves should be produced at their maximum efficient rate and the output sold.

Similarly, the Power Marketing Administrations principally perform electric utility functions which are not fundamentally Federal in nature. We believe non-Federal entities could perform the same services with equal or greater efficiency and be subject to local and regional control, as is true for most of the electric power now sold in the Nation.

Another new initiative in the FY 1987 budget involves cooperative research and development ventures with private industry consortia. Our Fossil Energy organization will conduct a pilot program in FY 1987 and the Conservation and Solar technology areas will investigate similar venture partnerships with industry. The use of cooperative research and development ventures should serve to concentrate resources on research and development activities that more broadly support industry, promoting more effective technology transfer and providing better leveraging of scarce Federal resources.

Our rigorous attempt to limit Federal support in FY 1987 to only the highest priority projects and programs whose success will serve the national interest has implications for FY 1986 as well. This policy has resulted in our withdrawing support from a number of activities deemed to have lower priority, deferring the funds thus saved, and using them to reduce the need for new budget authority for more worthy activities in FY 1987. We have no choice under the current and necessarily strict fiscal regimen but to concentrate scarce resources where they show promise of bringing the greatest benefits.

The budget proposes an indefinite moratorium on further development of the Strategic Petroleum Reserve (SPR) and a cessation of fill later this year when 500 million barrels of crude oil will be in storage. The SPR represents a wholly adequate "insurance policy" given the current energy situation, and, in fact, achieves the level of protection envisioned by Congress when it established the program. The moratorium will be reassessed as economic conditions and the world oil market conditions change.

The Environment, Safety and Health functions have been centralized and expanded, with greatly increased funding for oversight and planning activities under the direction of the new Assistant Secretary. This underscores the Department's commitment to give high priority to public and worker health and safety in our operations. Similarly, the Department will direct increased funding to another area of priority concern, which is upgrading safeguards and security at the Department's facilities.

With this as introduction, let me turn now to the major elements of the Department's FY 1987 budget.

Budget Overview

The FY 1987 budget for the Department of Energy is $12.1 billion, which is $400 million below last year's request and about one percent above the FY 1986 funding levels as reduced by the President's Sequester Order pursuant to the deficit reduction legislation. Outlays are anticipated to be approximately $12.5 billion. Within the $12.1 billion request the Department has sought to maintain the priorities and budget strategies which have characterized the Department's budgets since the advent of this Administration. These include a concentration on longer-term research and development leading to a balanced and mixed energy resource base, and a withdrawal from continued efforts in more mature technologies, where responsibility for further development should rest with the technology's private sector sponsors.

As mentioned above, legislation is being proposed to permit the transfer of Federal control over the Naval Petroleum Reserves No. 1 and No. 3 and the Power Marketing Administrations. However, pending Congressional approval of these proposals, full funding for these organizations in FY 1987 is included in the budget. Other legislative initiatives associated with this budget would modify the Federal investment repayment practices of the Power Marketing Administrations, without changing interest rates on past investments.

The Department's budget is presented in six categories. Each category groups activities which share common characteristics. The FY 1987 budget for Research and Development is about 7 percent below the FY 1986 level when amounts of new budget authority are compared. However, the level of actual program activity is higher, as FY 1987 will benefit from large sums of unobligated budget authority carried over from FY 1986 and made available for program use. Most of these unobligated balances will result from savings due to cost reductions in the Uranium Enrichment program, primarily the termination of the Gas Centrifuge Enrichment Plant.

Comparing funding levels within the Research and Development category at the level of actual program activity, increases in high energy and nuclear physics, environmental activities, supporting research, weapons research and development, and Naval reactors more than offset reductions to fossil, conservation, solar, nuclear energy and magnetic fusion programs.

Defense Production and Support, $4.8 billion, increases by $498 million from FY 1986, due to increased requirements from the Department of Defense for weapons systems, and for special nuclear materials for use in weapon systems and by the nuclear Navy.

The budget request for Waste Activities, $1.8 billion, is 30 percent greater in FY 1987 than FY 1986, with increases in all major program elements; the Nuclear Waste Fund, Remedial Action and Waste Technology, and Defense Waste Management.

The budget request for Business Enterprises is $691 million. Funding requirements for Business Enterprises are about 20 percent lower than in FY 1986. In addition to the uranium enrichment enterprise and the Strategic Petroleum Reserve, this category includes the Naval Petroleum Reserves and the Power Marketing Administrations, which the Administration will actively seek to transfer to non-Federal control. However, the budget includes full funding for these activities through FY 1987 to assure continuity of operations.

The Grants and Other Energy Functions category has a budget request well below the FY 1986 level, due primarily to the withdrawal of direct appropriations for State energy conservation grant programs. These programs will be able to rely on large sums made available to the States in restitution for petroleum pricing and allocation violations.

Departmental Management, which includes management and support functions in Washington and the field, is almost unchanged from FY 1986.

I would now like to discuss the budgets for selected program areas.

GENERAL SCIENCE

The budget request for the General Science appropriation in FY 1987 is $773 million, an increase of almost 18 percent over last year. The General Science account includes the High Energy Physics and Nuclear Physics programs, which are a major part of the National effort to identify the basic constituents of matter and the basic forces in nature.

A major feature of the High Energy Physics program in FY 1987 will be the first research operation of two major colliding beam facilities--the Tevatron proton-antiproton facility at Fermilab and the Stanford Linear Collider, an electron-positron collider, at the Stanford Linear Accelerator Center.

The highest priority for new construction in basic nuclear research is the Continuous Electron Beam Accelerator Facility at Newport News, Virginia. Construction will be initiated in FY 1987 for this unique, world-class facility.

The FY 1987 program also provides funding for research and development on superconducting magnets and systems related to the next generation particle collider. The results of prior research and development in this area will provide the technical information for Departmental review of a Superconducting Super Collider-type facility.

ENVIRONMENT

I have continued to stress the importance of environmental concerns at the Department, and the FY 1987 budget request reflects this theme. The funds requested for environmental compliance activities throughout each of the Department's program areas as well as for the Environment, Safety and Health program area have increased this year. The Department's programs are formulated in a manner that balances research and development and production requirements with the need to protect the environment. Funding for the Environment, Safety and Health program, which increases by almost 95 percent over the FY 1986 level, will support the key elements of the Department's long-range plan which provides for a strong emphasis on environmental and safety matters at DOE facilities.

The Department is conducting a baseline survey of all facilities to identify existing areas of environmental risk. Results from the survey will be used to prioritize areas requiring corrective action. We are committed to developing standards for environmentally sound operations at all DOE facilities.

OTHER ENERGY RESEARCH

This category includes Magnetic Fusion, Biological and Environmental Research, and Basic Energy Sciences.

The Magnetic Fusion budget of $333.0 million in FY 1987 is about 9 percent below FY 1986. Our focus this year will be on the development of the toroidal magnetic confinement system. The program has been structured to maintain the highest priority tasks, improve the cost effectiveness of facility operations, and increase the use of international collaboration. We have always stressed international collaboration in fusion research, and will be emphasizing this even more in light of the agreements reached at the Geneva Summit.

We are proposing a budget of $197 million for Biological and Environmental Research in FY 1987, which is an increase of 9 percent over FY 1986. This program represents the Nation's only long-term research effort specifically focused on energy-related health and environmental issues. The FY 1987 program will continue its focus on understanding the long-term health and environmental effects of radiation and energy-related chemicals. This program also performs research on such issues as acid rain and the so-called "Greenhouse effect."
The mission of the Basic Energy Sciences (BES) program is to perform generic, long-range, energy-related research in both nuclear and non-nuclear fields. The FY 1987 budget request of $441 million is slightly above last year's effort. In conducting this program, we support energy-related research and operate research facilities in the physical and biological sciences, engineering, applied mathematics, and geosciences. In FY 1987 funds will continue the construction of the Center for Advanced Materials at the Lawrence Berkeley Laboratory, and support

upgrades of the National Synchrotron Light Source at the Brookhaven National Laboratory and the Synchrotron Radiation Laboratory at the Stanford Linear Accelerator Center.

FOSSIL ENERGY

The Fossil Energy program is directed at establishing the scientific and engineering foundation to support private sector efforts to develop and deploy fossil fuel technologies. The budget request of $150 million concentrates adequate resources on high priority activities in coal, petroleum and gas technologies. Clean use of coal is the principal focus of our fossil program, and we will continue work in liquefaction, gasification, combustion systems, fuel cells, heat engines, and techniques for the direct combustion of coal in an environmentally sound manner.

The budget request is divided into three functional elements: Technology base development funds will provide direct support for basic, fundamental and crosscutting research through contracts and research grants directed principally to national laboratories, Energy Technology Centers, and universities. Applied research and development activities will be funded with industry using various contractual instruments. Finally, a cooperative research and development venture pool of $12.5 million will be established to fund applied research and development joint ventures with industry consortia. It is expected that the Department would take minority positions in these ventures, which would leverage scarce Federal resources and provide for more active technology transfer.

In addition to activities supported by the budget request, the Department will begin a 3 year Clean Coal Technology program this year, utilizing $397.6 million of previously appropriated funds. A solicitation for competitive proposals was issued on February 17, 1986. Projects will be cost-shared up to 50 percent by the Federal government, and will be selected by August 1, 1986.

RENEWABLE ENERGY

The focus of the Solar and Other Renewable Energy program in FY 1987 is on supporting research and development that will strengthen the technology base on which industry can draw in developing future new products and processes for the commercial market. The program supports activities ranging from basic research in universities and national laboratories to applied research and development and proof-of-concept projects in industrial firms.

Our budget request of $92 million continues program activities in each major solar and renewable technology area, but at levels below FY 1986. Reductions proposed in the 1987 budget will limit support to only the highest priority activities. We are also pursuing a new funding approach for applied, but pre-competitive, technology development involving partnerships with industry. Cooperative research and development ventures will be investigated, and expressions of interest will be solicited from industry. We believe that the use of cooperative research and development ventures will be an effective method of leveraging limited Federal resources, and has the additional advantage of promoting more effective technology transfer to the private sector.

CONSERVATION

The Department views conservation as an energy resource and its practice has made important contributions to the Nation's improved energy posture. The emphasis of the Energy Conservation Research and Development program is to assist the private sector by conducting research targeted at expanding the technology base upon which industry can draw in developing new products and processes for the marketplace. Although the FY 1987 budget request of $71 million is substantially less than this year's level, we believe that we are directing adequate funding to the highest priority activities.

We will continue efforts in all of our current research and development areas such as buildings and community systems, industrial and transportation conservation, and advanced concepts in energy conversion and utilization. In addition, the new cooperative research and development approach will be explored and expressions of interest will be solicited from the private sector regarding their participation.

The budget request proposes no further Federal support for the Conservation Grants programs, except for a small amount in FY 1987 to fund the orderly close-out of Federal responsibilities. We believe that the States should assume responsibility for these activities. They will be able to make use of very large sums specifically designated for conservation and other energy-related activities which will be made available to them in restitution for oil pricing and allocation violations. Continued use of appropriated Federal funds for these programs is, therefore, no longer necessary.

NUCLEAR ENERGY

The emphasis of the Department's Nuclear Energy programs in FY 1987 is being shifted to ensure that nuclear energy contributes to civilian needs for a balanced and secure domestic energy base as well as emerging military needs to meet national security objectives. The budget request of $333 million, is slightly below the FY 1986 level. However, we have structured a program to coincide with the anticipated timing for commercial deployment of advanced reactors beyond the light water reactor, and which also meets increasing space and defense nuclear energy requirements. This essential program fits within the limited resources available during times of budgetary constraints.

The Light Water Reactor program will continue with emphasis on supporting a process leading to enhanced safety, rationalized licensing, and certification of advanced designs. These cost-shared activities are closely coordinated with industry and complement industry's own efforts.

The primary emphasis in advanced reactor research and development is to support national security requirements, including the Strategic Defense Initiative. We expect that benefits will accrue from this research and development that can be applied to future commercial reactor development efforts.

DEFENSE ACTIVITIES

The Department's FY 1987 budget request for Atomic Energy Defense Activities is $8.2 billion. The request meets the requirements of the Department of Defense for weapons production and deliveries. It also includes research on new and improved weapons, testing, production of special nuclear materials, and Naval reactors development.

Weapons research, development, and testing is a large portion of the defense programs budget at $2.1 billion. This includes weapons design, advanced weapon technology, support for the Strategic Defense Initiative, the testing of new weapons, and monitoring and testing of the nuclear weapons stockpile to assure continued reliability and effectiveness.

Weapons production and the production of special nuclear materials are funded at $2.5 billion and $2.0 billion, respectively. The Department's defense production activities respond to the requirements of the Defense Department and the need to modernize the Nation's defense force structure. In FY 1987 we will have eight weapons in production and pre-production efforts will be conducted on another 11 systems.

Within the Atomic Energy Defense appropriation, we also fund the Naval Reactors Development program which designs, develops, tests, and ultimately disposes of naval nuclear propulsion reactor components and cores. The FY 1987 budget is $594 million, up from $536 million in FY 1986. This increase is due primarily to increased research and development on an Advanced Fleet Reactor and for increased servicing requirements for the eight land-based prototype reactors.

WASTE ACTIVITIES

The safe management and disposal of civilian and defense nuclear waste and cleanup of contaminated facilities have long been prominent elements of the Department's nuclear and defense programs. These programs involve various types of high and low-level waste originating from civilian and defense sources. The budget request for each of these programs has increased in FY 1987.

The Nuclear Waste Fund activities are budgeted at $769 million, a significant increase over FY 1986's $499 million. These funds are directed toward disposal of spent nuclear fuel and high-level radioactive waste in mined, geologic repositories, and the study of monitored retrievable storage.

The Fund is financed by fees collected from owners and generators of spent fuel high-level waste. The increased FY 1987 request will provide for extensive site characterization, continued exploratory shaft design and construction, and intensive engineering tests and analyses required for the first repository. The program is progressing toward initial operation in 1998. The FY 1987 budget also provides support for the continuation of preliminary field investigations and design for a possible second repository. Twelve potentially acceptable second repository sites were proposed in January.

The Department also has two other program areas in which radioactive wastes are treated, stored, or prepared for ultimate disposal. The Defense Waste Management program provides for the interim storage of radioactive wastes generated throughout the DOE complex during the production of special nuclear materials used in the defense production facilities. A highlight of this program in FY 1987 is the continued construction of the Defense Waste Processing Facility at the Savannah River Plant, and the Waste Isolation Pilot Plant at Carlsbad, New Mexico. The Remedial Action program objective is to treat or stabilize radioactive waste and clean up contaminated DOE and certain non-government facilities and sites. The budget in FY 1987 is $294 million, an increase of 28 percent over FY 1986. This increase will maintain the schedule for cleaning up high priority sites throughout the country.

STRATEGIC PETROLEUM RESERVE

The Department intends to continue filling the Strategic Petroleum Reserve (SPR) in FY 1986 until the inventory reaches a level of 500 million barrels, in compliance with current law. No additional oil purchases are planned for FY 1987. Given the current world energy environment, the SPR inventory is more than adequate for use in the event of a supply disruption. In light of this decision, continued creation of storage capacity is unnecessary at this time. Therefore, we are planning to curtail certain development activities during FY 1986 to reduce near-term federal spending for facilities which are not presently required. Funding for these activities is being deferred and proposed for use in FY 1987 for standby operations and maintenance. As a result, no new appropriations are requested. This moratorium on development and suspension of fill of the SPR will be reassessed as economic and oil market conditions change.

URANIUM ENRICHMENT

The budget request for uranium enrichment is $1.3 billion, down slightly from FY 1986, and is offset by revenues of the same amount. During the last year, we have taken strong actions to revitalize this country's uranium enrichment business. We have streamlined the program, reduced costs, and reduced prices to customers, thus demonstrating our ability to compete in the world market. Through several creative marketing initiatives, the U.S. share of the free world enrichment market increased from 46 percent in 1985 to an estimated 53 percent in 1990. This will result in additional revenues of over $500 million during 1987 - 1990. We are confident that we can get our prices into the world competitive range using the existing gaseous diffusion capacity.

To ensure more efficient commercial deployment of advanced enrichment technology, the Department intends to transfer the development and ultimate deployment of the Advanced Vapor Laser Isotope Separation (AVLIS) process to the private sector.

In FY 1987, we are also proposing to begin repayment of the unrecovered Federal investment in the uranium enrichment program. The total Federal investment to be repaid is $3.5 billion. In FY 1987, $235 million in revenue collections will be returned to the Treasury.

NAVAL PETROLEUM AND OIL SHALE RESERVES

A major initiative will be undertaken to privatize the Naval Petroleum Reserves in FY 1987. Legislation authorizing the sale of the federal interest in Reserves No. 1 (Elk Hills) and No. 3 (Teapot Dome) will be submitted this fiscal year with the intent of conducting the sale as promptly as possible, probably in FY 1987. The government's role, which has changed from maintaining the Reserves for national security reasons to producing them at their maximum efficient rates and selling their output competitively, is better fulfilled by private industry. In the interim, the Department will continue to develop, operate and produce the Reserves until the sales are completed. The amount requested for FY 1987 will fund the Naval Petroleum and Oil Shale Reserves for the entire year. Once the sales take place, a rescission of any remaining budget authority will be proposed.

POWER MARKETING ADMINISTRATIONS

There are two major initiatives affecting the Power Marketing Administrations in FY 1987: defederalization and modification of repayment practices.

We will pursue defederalization through an open and competitive process. The goal will be to seek a fair return to the Federal taxpayers from the defederalization of these assets, while recognizing the benefits currently enjoyed by existing customers, and recognizing and providing appropriate protections for the personnel benefits of Federal employees. Before implementation of this proposal, the views of concerned groups and individuals, including appropriate Congressional Committees, State and local officials, current customers, the financial community, and public power and private sector energy interests will be considered.

Funds are included in the budget for operating the power marketing administrations in 1987, but we will actively seek to defederalize these utility systems. We expect that all five PMAs will be transferred from federal control by 1991. In the interim, the Department is proposing to modify the PMA capital investment repayment process legislatively to protect the interest of the taxpayers. These modifications require repayment of the unpaid balance of the original federal investment at a level not less than would be required under a fixed, straight-line amortization schedule for each power investment financed by appropriations and placed in service. The impact of this proposal is relatively modest.

Mr. Chairman, I believe that the budget I have summarized meets the Department's responsibilities in its several mission areas in a manner which recognizes today's fiscal responsibilities and tomorrow's anticipated needs.

BIOGRAPHICAL SKETCH

JOHN S. HERRINGTON

On January 18, 1985, John S. Herrington was nominated by President Ronald Reagan to be the fifth Secretary of Energy. Mr. Herrington was confirmed by the United States Senate on February 6, 1985, and sworn into office on February 7, 1985.

Prior to joining the Department of Energy, Mr. Herrington served in the White House as Assistant to the President of the United States. Before assuming that post, he served as Special Assistant to the Chief of Staff, the White House, from February to May 1983. Mr. Herrington also served as Assistant Secretary of the Navy from October 1981 to February 1983. He was a member of the Reserve Forces Policy Board, the Military Manpower Task Force Working Group, the Department of Navy Review and Oversight Council, and Chairman of the Defense Department Per Diem Committee. For his service in the Department of Defense, Mr. Herrington was awarded the Distinguished Service Medal, the Department's highest civilian award. Mr. Herrington also served as Deputy Assistant to the President and Director of Presidential Personnel after he moved to Washington in January 1981.

Mr. Herrington was born in Los Angeles, California, May 31, 1939. He graduated from University High School, Los Angeles, California, in 1957. He is a graduate of Stanford University where he received his A.B. degree in economics in 1961. Mr. Herrington received his LL.B. and J.D. degrees at the University of California, Hastings College of Law, San Francisco, California, in 1964. Mr. Herrington has been a practicing attorney in California since 1965 specializing in corporation, real estate, taxation, and business law. He also expanded his interests into real estate development, ranching, restoration of historic buildings, and other investment undertakings. Mr. Herrington has also served as a Deputy District Attorney in Ventura County, California, and a First Lieutenant in the United States Marine Corps Reserves.

Mr. Herrington is married to Lois Haight Herrington, Assistant Attorney General of the United States. They have two daughters, Lisa Marie (age 19) attending the University of California at Los Angeles, and Victoria Jean (age 18) attending the University of Southern California. The Herringtons reside in McLean, Virginia.

June 1985

STATEMENT OF SENATOR MATTINGLY

Chairman HATFIELD. Does the Senator from Georgia have questions he wishes to ask?

Senator MATTINGLY. Mr. Chairman, I have a statement I would like to have entered in the record.

Chairman HATFIELD. The statement will be included in the record.

[The statement follows:]

STATEMENT OF SENATOR MACK MATTINGLY

Mr. Secretary, I want to commend the Department of Energy for its involvement, through the biological energy research [BER] subprogram, in supporting complex carbohydrate research activities. As I have expressed in the past, I believe that research in this area is of critical importance to this Nation and its future.

As the Secretary is aware, last October the University of Georgia established a complex carbohydrate research center which has attracted Dr. Peter Albersheim and his team of distinguished scientists to the university. Major financial support of the team's research has been provided through competitive grants within the biological energy research program for years.

In October and December, I requested that the Department of Energy give serious consideration to providing Federal support to the University of Georgia's complex carbohydrate research center as part of its fiscal year 1987 budget request. I note that the departmental budget request acknowledges the importance of complex carbohydrate research. Specifically, the request states that the funding levels suggested by the Department will allow for enhanced support for ongoing projects in complex carbohydrate research. In addition, it states that an effort will be made to "respond to a few of the numerous very high quality research opportunities presently available in these areas."

The University of Georgia clearly represents one of these "very high quality research opportunities," perhaps the highest. Will specific consideration be given to substantial, ongoing support for the University of Georgia's complex carbohydrate research center? What portion of BER Program funds are set aside for these "research opportunities?" When and how will specific allocations be made?

1985 FARM BILL AMENDMENT

Senator MATTINGLY. Mr. Secretary, I know you are aware of the amendment which I had offered, which was adopted in both the 1985 farm bill and the concurrent resolution, making surplus Commodity Credit stocks available for exchange in acquiring petroleum products, including crude oil for storage in the SPRO.

My question today is directed to your plans to utilize this feature and what sort of timetable we might expect.

Secretary HERRINGTON. Yes, sir, we are aware of that amendment, and we have not yet begun activity on it, with the exception of a review. I am pleased to say that there is interest and there are inquiries as to how we might implement it.

I think it has promise. It is something that we will want to pursue.

Senator MATTINGLY. You know that some of the foreign suppliers of petroleum products are really interested in exploring a possibility, such as swaps. I assume you are aware that some of those countries are?

Secretary HERRINGTON. Yes, sir, we are.

Senator MATTINGLY. I might point out, a representative—I think it was PEMEX, the Mexican oil company—had called my office just prior to that final conference approval on that farm bill inquiring about the plans. They seemed very interested at that time. I am certain that they will be right now.

I would just like to have one other question answered which I would like to submit for the record for your later response. It deals with the departmental plans, or lack thereof, in research in the complex carbohydrates. I would appreciate it if you could send that for the record later.

Secretary HERRINGTON. Yes, we would be pleased to.

Senator MATTINGLY. I think it would be worthy of your pursuit, which I am certain you are for, instead of us spending money out of the Treasury there is the possibility of using surplus commodities, which have already been paid for, to swap for oil which can then go into SPR.

Thank you, Mr. Chairman.

Chairman HATFIELD. The Senator from South Dakota?

Senator ABDNOR. Mr. Chairman, I don't have any questions at this time. I plan to submit some questions in writing, though.

ATOMIC ENERGY DEFENSE ACTIVITIES

Chairman HATFIELD. Mr. Secretary, your budget request proposes an increase for atomic energy defense programs of about $1 billion—a 14-percent increase from $7.2 billion in fiscal year 1986 to $8.2 billion in fiscal year 1987.

What level of inflation was assumed for this account in your budget, and what percentage of real growth over the Gramm-Rudman adjustment appropriation for fiscal year 1986?

Secretary HERRINGTON. The assumption for inflation on that budget is 4.5 percent. The real growth is computed at 3 percent.

Chairman HATFIELD. Can the Department effectively absorb another large increase, doubling the program in 1 year? You may wish to provide the committee with a detailed breakdown of the request showing the 1985, 1986, along with your 1987 level. We would be very happy to have you do that for the record.

But in general, do you think you can absorb that kind of rather dramatic increase?

Secretary HERRINGTON. Mr. Chairman, I think the increase is driven by two primary factors: We have had a real careful look at both these programs. One is the administration's strong position in support of SDI and the milestones that we at the Department of Energy are required to meet at our national laboratories.

The other is the task of providing sufficient materials and weapons under the President's Nuclear Weapons Stockpile Memorandum that we are tasked to do. In both those cases we are the managers of these projects, and I believe we can meet the goals and milestones that we are required to.

NUCLEAR ENERGY RESEARCH

Chairman HATFIELD. Mr. Secretary, would you turn to page 13 of your statement, please?

On page 13, you indicate that the budget proposes a fundamental shift in funding of nuclear energy R&D activities. As I read it, your 1987 budget request proposes some large shifts, particularly in the advanced reactor research, away from civilian reactor research into military research. Now, my question is, can you tell the committee to what extent this change is toward military applications or elaborate on that, and is this a short-term or a long-term shift as far as the future is concerned?

Secretary HERRINGTON. I think the reason behind the shift is something that I ought to point out first. In our estimation, having less money to devote to new programs has forced us to pick winners and losers among the various programs that we are operating in the civilian sector. Some have done well; some have done not as well.

The next point is shifting into the military area allows joint funding with the military. In other words, we are able to leverage our money a little more effectively by going into projects with the Army or with the Air Force for small reactors with primarily military-type applications.

It seems a prudent thing to do, in that we will be able to keep the programs going, and the reactors that we are working on don't have strictly military applications. I think there can be civilian uses for some of the spinoffs.

Finally, whether it is a long-term policy or a short-term, I don't feel I can answer today sufficiently based on where we are.

Obviously, if the deficit were not as it is, we perhaps would not make that shift as we have. But we don't know the total impact of Gramm-Rudman at this point.

MILITARY VERSUS CIVILIAN RESEARCH

Chairman HATFIELD. Mr. Secretary, I wonder if we could get the benefit of your further reflection on this point, because actually, it can communicate, at least to some, an appearance that the Department of Energy is becoming more like an arm or a division of the military, for in this budget we see some rather significant civilian functions that are being cut, and we see some military applications being increased.

I think that it is well to take stock of this shift, both from the standpoint of a philosophical commitment, but also as to whether this is a temporary situation or if this means an establishment of a foundation for a long-term objective that would continue this kind of trend.

I really feel very strongly that before we launch into 1987, we ought to have some reflection or some responses to this perception that at least we see, and the budgetary implications of it today and 3 years from now.

We have other questions that we will submit in writing, but I wonder if you would address that particular perception in terms of the general philosophy and commitment of the Department?

SHIFT OF NUCLEAR ACTIVITIES TO DEFENSE

Secretary HERRINGTON. Yes, sir, I would be happy to.

I also have read numerous things on the shift of the Energy budget into the defense area, and in putting together this budget, I looked at it very carefully with that in mind.

Some things have occurred to me that I think are relevant; that perhaps this committee has been through many times, but they might need to be said again. If you take all defense activities, as we have them set out in the budget, I would submit that there are many activities under the category of defense activities that are not direct program defense activities. There are some environmental cleanup activities. There is some upgrading of facilities that have been neglected for many years, and other types of indirect activities, such as this, that are put in the defense category.

If you put all those together against an appropriated fund of $12.1 billion, you would come up with a figure of about 67 percent in the defense category of our total budget. But that, too, is misleading, because this Department, as is well known, does the uranium enrichment business, which is substantial. We are, today, operating Power Marketing Administrations around the country on a no-profit, no-gain type basis.

So the $12.1 billion in appropriated funds, to me, is distorted, because if you took the gross magnitude of DOE activities, you are speaking in the range of $19 billion. Put the defense programs against that figure, and you are talking in the range of 43 percent.

Is this long range or short range? I think everybody in this room hopes it is short range. It depends on a lot of things. What type of progress can we make on SDI, which I think is going very well. What kind of progress can we make at the arms negotiations talks? How much longer does the Energy Department have to produce the type of weapons that we are putting out at this point?

I think there are a lot of variables. I think our policy is that it would be better to be a short-term activity. I think right now with the development of SDI and the requirement to meet our goals of the stockpile memorandum, we have to say that in the foreseeable future, this trend would stay the same.

Chairman HATFIELD. Mr. Secretary, I think you would agree, though, that taking, say, the nuclear waste costs, you would have to certainly pro rate a major portion of that to the defense-related activity that produced the waste in the first place. You can't ascribe all that cost to a nondefense or civilian part of your program, could you?

Secretary HERRINGTON. No, I think you are 100-percent correct, but the perception that 67 percent of the Department of Energy makes weapons is out there. People write about it and talk about it. And I think that is misleading. There are activities that are not weapons activities. Just as in the Defense Department, for instance, there is a huge portion of their budget involved in DOD schools. Perhaps that should be over in the Education Department.

You can't call all activities by one particular name. There has to be some delineation.

POWER MARKETING ADMINISTRATIONS

Chairman HATFIELD. Mr. Secretary, I notice on page 18 of your testimony a section devoted to what you entitle "Power Marketing Administrations," in which you refer to a two-initiative program, two-pronged initiative of the administration to defederalize and modification of repayment practices.

Having a slight interest in this particular proposal, I assume that a position that has been taken, I believe, by the Department relating to repayment schedules remains the same; namely, that any change in that particular repayment schedule would be initiated only after enactment of legislation to change existing policy.

Is that correct?

Secretary HERRINGTON. Yes, sir. I made that commitment in my confirmation hearing, and we intend to stick by that.

Chairman HATFIELD. As you know, my interest in the Bonneville situation is that the ratepayers have made, this year, a $686 million payment, $237 million of that on principal, and it looks as though they will be making a similar payment this year, which will make it pretty much current with the obligations under the present repayment schedule.

The second part of that initiative relates to defederalization of the PMA's. I note the language on page 18 of your statement says that—I am reading now from your testimony in the middle paragraph:

> Before implementation of this proposal, the views of concerned groups and individuals, including appropriate congressional committees, State and local officials, current customers, the financial community, and public power and private sector energy interests will be considered.

Could you elaborate on that phraseology as it might relate to an alternative or an option of legislation being enacted before defederalization could or should occur?

Secretary HERRINGTON. I don't look at it as an option. I would think it is part of the process.

What I mean by that proposal is that the sale of an asset the size of Bonneville Power would probably dwarf most of the financial transactions that many of us are used to. It is complicated, and it is difficult, and it is something that cannot be done overnight.

What I am saying is, before taking on such a project, you would need to have major input from groups involved. One example would be that there needs to be a very good look at who your buyer would be, and then you have to look at what price. The budget number that we have used is simply a plug number, but a great deal of sensitivity would need to go into that process.

Chairman HATFIELD. Let me go back and rephrase my question. Let's separate Bonneville out from the other PMA's, because it is distinctive, as you well know, in both the enabling legislation, the generic legislation, and the current status of that facility.

Will the administration initiate sale of Bonneville assets only after enactment of legislation?

Secretary HERRINGTON. Yes.

Chairman HATFIELD. Yes. In other words——

Secretary HERRINGTON. That is our position.

Chairman HATFIELD. You foresee the requirement or the necessity of having specific legislation in place in order to sell assets of one kind or another currently a part of the Bonneville Power Administration?

Secretary HERRINGTON. Yes, sir, I do.

Chairman HATFIELD. I have separated my question deliberately, and now take the other PMA's as distinctive to Bonneville, because they are different.

Do you foresee the necessity of having in place legislative authority or authority established by legislation before you would sell or put up for sale assets relating to the other PMA's?

Secretary HERRINGTON. Yes.

Chairman HATFIELD. You would? In other words, legislative foundation would have to be established to dispose or sell any assets from any of the PMA's in your view?

Secretary HERRINGTON. That is the administration's position, yes.

Chairman HATFIELD. That is the administration's position. I am so grateful to find these areas where we can agree. [Laughter.]

Especially on an issue like this one.

You are the finest Secretary of Energy we have had, I think, for a very long time; taking that position fully qualifies you to be Secretary of Energy for as long as you want. [Laughter.]

Secretary HERRINGTON. Thank you, Mr. Chairman.

Chairman HATFIELD. I got through that one.

The Senator from New Mexico is recognized.

Senator DOMENICI. Thank you very much, Mr. Chairman.

I understand I have submitted a very lengthy list of questions in the authorizing committee that the Secretary has been asked to answer. I have an interest in a number of those. I think you are qualified to be Secretary for quite a long time, even before you answered the chairman's question. I do appreciate all you are doing in the Department, and I commend you for it.

WASTE ISOLATION PILOT PLANT

I would like to ask a couple of questions that have concerned me and that are parochial. I note that the gentleman in the Department who is presently trying to find a permanent underground site in this country for the disposal of high-level nuclear wastes is here with you. I didn't think we were going to have such early problems with that statute as you are having, but it does bring to mind the waste isolation pilot project in New Mexico. I think you are aware of that facility, are you not, Mr. Secretary?

Secretary HERRINGTON. Yes, sir, I am.

Senator DOMENICI. Let me tell you how the WIPP project finally got sufficient support in the State of New Mexico to proceed. After a lawsuit, much farther along in the proceedings than you are now, a settlement, overseen by the U.S. district court, was entered into between the Department of Energy and the State of New Mexico that prescribes the kind of things that the State and the Federal Government are responsible for.

I would like to remind you that we have set up various processes to work through consultation and concurrence. We are very proud that they are working. I wish the States involved in the first high-level waste disposal project would look at these processes, because they have been a very significant way to have input into the protection of health and safety.

For the WIPP project, there is a requirement that certain roads that are going to carry the waste to the WIPP site be upgraded and paid for by the Federal Government.

In addition to other stipulations and agreements on the waste isolation pilot project, Mr. Secretary, there was a part of the stipulated agreement that said that the roadways that go into the waste isolation pilot project, that are going to have to carry the trucks with the waste material, are insufficient. It said that the Federal Government would provide resources to upgrade those roads.

We have had, now, in my recollection, four Federal budgets since the stipulated agreement was entered into. The last budget submitted by you does not fulfill that mandate. We have had to fund the WIPP roads with the assistance of the Appropriations Committee. I really believe that we are going to have to do it this way this year, because funding for the WIPP roads is again not in the President's budget.

I do urge that you and others who are involved with the WIPP project take a look at this and see if you can at least assist us by telling the chairman and ranking member that there is a commitment on the part of the Government to fund the WIPP roads. They have voted in the money without the administration requesting the road improvements, but with tight budgets, it gets more and more difficult. I understand that.

But clearly, I don't think the State of New Mexico ought to be left to totally implement what the Federal Government concurred with and agreed to in a stipulated agreement overseen by the U.S. district court.

Might I ask whether you would look into this matter? If I am stating the facts right, could you at least state to the committee what you think the Department's responsibility is?

Secretary HERRINGTON. Yes, sir. It is still our position, sir, that we do have a commitment on that. We have every intention of complying with the law on that particular point.

CHANGE OF CONTRACTOR AT LOS ALAMOS

Senator DOMENICI. I appreciate that.

With reference to one other item of interest to New Mexico. At the scientific lab in Los Alamos, you have put out to bid a new operation and maintenance contract for the lab. The new contractor is going to be Pan Am in lieu of a longstanding contractor called the Zia Corp. I understand that the time had come for a new contract, and I have no argument with letting it.

I would only ask that you be aware of the fact that this is a very major transition for some 1,800 workers, and while it is not directly under you, Mr. Secretary, I hope you understand that it is absolutely imperative that that be done properly. The ultimate goal is efficiency and productivity, and I have no argument with that. The new contractor apparently agrees to do it for less money over the foreseeable contract period, and I can't argue with that.

I just hope that they also understand that when you have had a contractor with employees for over 30 years, that it is a very, very difficult transition. I hope they will be considerate as they proceed through the final negotiations and the transition to a brand new employer for many people who have been working there for 15 to 30 years.

Secretary HERRINGTON. I think we can try to be as sensitive as possible to that, working with our contractor at the University of California, and monitor this as best we can. Every effort will be made.

Senator DOMENICI. Thank you, Mr. Secretary.

Thank you, Mr. Chairman.

Chairman HATFIELD. Thank you.

The Senator from Wisconsin.

CLEAN COAL TECHNOLOGY PROGRAM

Senator KASTEN. Mr. Chairman, thank you very much.

Mr. Secretary, I have had an active interest in the Clean Coal Technology Program and, as you know, I sponsored an amendment, along with the Senator from West Virginia, Mr. Byrd, setting up this $400 million program outlining the timeframe for selecting clean coal projects under the program.

There are a number of different clean coal projects that are part of this overall program. I have one of particular interest—Wisconsin Electric is one of the many groups that are interested. They have been working on a pressurized fluidized bed project to burn coal without polluting the environment. They are already planning to spend $600 million of their own money to move on with this project and to accomplish that goal.

So that is good news. They are moving along, and I am pleased.

I am also pleased to hear that the program opportunity notice is out and that the Clean Coal Technology Program is moving on along schedule here. In general, it appears that we are moving in the right direction. As I said, they are going forward with their private sector development, also.

But there are a couple of specific concerns that I just wanted to raise with you.

First of all, the program opportunity notice states that: "The Department of Energy intends to recover any profit resulting from the clean coal project sites." This program, at least in the beginning, was set up to further research into efficient, clean, coal power systems. It wasn't intended to raise revenues, as I understood it.

Could you clarify the Government's position on the recovery of the Department's investment, if that is what you are getting at, in clean coal technology, and what do you mean in terms of recovery of the Government's revenues?

Secretary HERRINGTON. I think there was some misunderstanding when that first came out, not because of anybody's fault. The wording was not quite as clear as it could have been. We have clarified it.

What we have in mind is exactly what you say as far as promotion of clean coal. There is a possibility that some of these systems will become profitable and, in that case, we would like to see the Federal Government, out of profits and after a period of operation, work out some sort of repayment schedule for the amount of money the taxpayers donated to that project. It in no way would be used in negotiating this contract, that type of term, to discourage companies or to hinder the projects that are ongoing.

Senator KASTEN. Therefore, this is one more step in your evaluation? You are going to try to figure out how much revenue you could then take out of a project once it became successful? It is complicated.

Secretary HERRINGTON. Sure.

Senator KASTEN. Because we are not only dealing with a "for-profit" company, but we are also dealing with a regulated industry in the case of Wisconsin, and we get involved with questions and decisions made by the utility ratesetters in the overall process. I wonder; I don't quite understand when you say you are going to work it out and negotiate it with the companies if and when the technology becomes profitable.

Secretary HERRINGTON. I don't think this repayment or recoupment of taxpayer dollars is a condition of picking the winners and losers in the request for proposal.

That certainly is outside the intent. What we are looking for there is the most promising technology and the best investment of clean coal money that we are going to be putting out. That is the sole criterion.

The next step is down the line. If one of these companies becomes very successful and has the ability, then we would like to talk to them about recoupment of the investment that the taxpayers have given them, and I think that is fair.

I think it is legitimate to ask a company that benefits substantially from a Federal grant of clean coal money that if they are successful and profitable that they be in a position to talk to us about repayment of that money.

Senator KASTEN. I don't disagree with the overall concept. I am just suggesting that it might not be the easiest thing to work out, especially when we are in the position that we don't know whether we have companies that can make this work, although I think we are close in the one that I know a little bit about, and if and when it makes money, and if it does, those dollars are going to be reflected in rates which are going to be passed on to consumers before you are going to be able to negotiate profits coming back to the Federal Government.

CLEAN COAL PROPOSAL SELECTION

Secretary HERRINGTON. My answer is that we would not negotiate any kind of repayment or recoupment and the terms thereof until after the proposal selection. During the contract negotiations, I think that is a legitimate item of discussion.

Senator KASTEN. But for the present time, right now, we are looking at this program in terms of furthering research into efficient, clean, coal power systems, and that is the primary criterion, and that is where we are as of this minute.

Secretary HERRINGTON. Yes, sir; that is the primary criterion.

Senator KASTEN. In the program opportunity notice, it also states that clean coal projects funds would be dispensed from 1986 to 1988. If negotiations between your Department and particular project sites were not complete before October 1 of this year, October 1, 1986, does that mean that the 1986 funding effect would be lost?

Secretary HERRINGTON. We intend to carry forward on this. In fact, we don't expect to be in actual contract negotiations until August, I would say. Some of those could take that long.

Senator KASTEN. If you lapped over, we wouldn't lose the 1986 money, it would be carried over into 1987?

Secretary HERRINGTON. Yes, sir.

Senator KASTEN. Or we would be able to get the project going?

Secretary HERRINGTON. That is our intent.

Senator KASTEN. The program opportunity notice says the Federal Government will match dollar-for-dollar the three phases of the project—the engineering phase, the construction phase, and the testing phase. In some large projects, such as the one that I am familiar with in Fort Washington, WI, the pressurized fluidized bed project that I talked about, construction won't be completed until 1989, and testing won't start until 1990.

If a project with the same kind of schedule were selected, would the Department make the matching money available between 1988, and it is the same basic concept we were touching on before?

Secretary HERRINGTON. Yes. The answer is "Yes."

Senator KASTEN. Mr. Secretary, thank you. I also want to join my colleagues here in commending you on the job that you are doing in the Department of Energy and as part of the President's Cabinet.

Secretary HERRINGTON. Thank you, sir.

Senator KASTEN. I thank you very much for the work you are doing. Thank you, Mr. Chairman.

Chairman HATFIELD. Thank you, Senator.

Mr. Secretary, I know you probably have a very busy schedule. If you wish to be excused, you may.

Secretary HERRINGTON. Thank you, sir, I appreciate it.

Chairman HATFIELD. Thank you for your time today and your cooperation. We look forward to working with you on all these matters.

Secretary HERRINGTON. Thank you.

DEPARTMENTAL ADMINISTRATION

Chairman HATFIELD. Assistant Secretary Hesse, do you wish to make your statement? Your full prepared statement will be incorporated in the record. I believe you are submitting some statements on behalf of other offices in the Department as well.

Ms. HESSE. Yes, sir.

SUMMARY STATEMENT

Mr. Chairman, I do appreciate the opportunity to appear before you today in support of our fiscal year 1987 budget request. I would like to submit my prepared statement for the record, as well as the separate statements detailing the requests of the six remaining major organizations under "Departmental administration."

I think that during the last year, we have implemented a number of management improvements that are aimed at increasing both the administrative and fiscal efficiency and effectiveness, and some of the accomplishments that we have been able to achieve are sort of firsts for the Government. I would just like to name a couple of them.

We have a consolidated payroll and personnel system which now supports 95 percent of the field offices. We also have a departmentwide integrated and standardized core accounting system. Both of these systems, by the way, are goals of this administration in improving efficiency and effectiveness of the executive branch, and the Department of Energy is the very first organization to achieve those goals.

I think that the fiscal year 1987 budget authority for these activities is slightly more than $315 million. This includes $155 million for salaries and related expenses; $133 million for support services and capital equipment; plus $16 million for the In-House Energy Management Program and $11 million for the Technical Information Management Program.

The overall staffing and program level for these support activities under the "Departmental administration" account is essentially the same as reflected in fiscal year 1986. I think that in the interest of time, that will conclude my presentation.

I would be pleased to answer any questions you may have.

[The statements follow:]

STATEMENT OF MARTHA O. HESSE, ASSISTANT SECRETARY FOR MANAGEMENT AND ADMINISTRATION, DEPARTMENT OF ENERGY

Mr. Chairman, members of the subcommittee, I am Martha O. Hesse, Assistant Secretary, Management and Administration, of the Department of Energy. I appreciate the opportunity to appear before you today in support of the fiscal year 1987 budget request for the departmental administration appropriation, and for the Technical Information Management Program and the In-House Energy Management Program requested in the energy supply research and development appropriation.

The fiscal year 1987 budget authority for these activities is $315.3 million. This includes $155.1 million for salaries and related expenses, $132.9 million for support services and capital equipment, $16.5 million for in-house energy management, and $10.8 million for the Technical Information Management Program. In addition to these activities, $115.1 million is requested for the Cost of Work for Others Program, which will generate $143.4 million in revenues. An additional $108.5 million in other revenues will be generated from the sale of incidental byproducts.

My testimony on departmental administration will cover management and administration, the Office of the Secretary, five multipurpose operations offices, and the financial accounts of Cost of Work for Others Program, and miscellaneous revenues. Under the energy supply research and development appropriation, I will discuss the In-House Energy Management Program and the Technical Information Management Program. Although I have given you the total funding levels requested for departmental administration, separate statements detailing the requests of the remaining six major organizations under the departmental administration appropriation will be submitted for inclusion in the record. These organizations include General Counsel, Inspector General, the Office of Minority Economic Impact, the Office of Policy, Planning and Analysis, the Assistant Secretary for Congressional, Intergovernmental and Public Affairs, and the Assistant Secretary for International Affairs and Energy Emergencies.

ACCOMPLISHMENTS

During the past year, we have implemented a number of management improvements aimed at increasing administrative and fiscal efficiency and effectiveness:

- The Department's personnel and payroll system [PAY/PERS] has been expanded to support 95 percent of the field offices, with full implementation to be completed by July 1986. In addition, we are currently providing personnel system support to several outside agencies—the Inter-American Foundation, the African Development Foundation, the Occupational Safety and Health Review Commission, and the Office of the Federal Inspector for the Alaska Pipeline.
- The DOE-wide departmental integrated standardized core accounting system [DISCAS] was successfully implemented. This is a major step in working toward the administration's objective of implementing within each agency a uniform accounting system to improve the quality, integrity, and timeliness of financial information.
- An Automated Office Support System Training Program was established which covers the full range of microcomputer software products supported at headquarters. Also, a training center was established to accommodate microcomputer, word processing, and all other ADP training for headquarters' personnel. Over 3,300 employees attended these courses in fiscal year 1985.
- The Department has successfully negotiated pension language in the contracts of most operating contractors to ensure that upon termination of the contracts, excess assets will revert to DOE after contract pension obligations have been satisfied.
- Goals were established for the timely closeout of inactive contractual instruments. These efforts resulted in contract closeout of more than 6,800 instruments. These activities have greatly reduced the inventory of inactive contracts.
- Small and disadvantaged business participation in DOE procurement and financial assistance awards was improved. During fiscal year 1984, we achieved $2.3 billion in the small business programs and $292 million in the minority business programs. These figures rose to approximately $2.5 billion and $310 million, respectively, for fiscal year 1985.
- DOE fully implemented the requirements of the Competition in Contracting Act of 1984 [CICA], Public Law 98-369. With the support of the Secretary, we established a Competition Advocacy Program agencywide which included naming competition advocates, training, utilization of data, advance planning, compliance reviews, and congressional reporting.
- The Office of Scientific and Technical Information Management implemented an online retrieval system which provides classified research results, in a controlled en-

vironment, to authorized users on a nationwide basis utilizing encrypted and secure voice equipment.

MANAGEMENT AND ADMINISTRATION

Management and administration provides the essential management and institutional systems and services necessary to support the Department's programs and missions. A major goal of management and administration continues to be the reduction of administrative overhead and the promotion of increased efficiency and effectiveness in management, administrative, and financial support systems and services. The fiscal year 1987 program request of $146.1 million for management and administration includes funding for employee salaries, benefits, and travel for the Office of Administration, the Office of Controller, and the Procurement and Assistance Management Directorate. The request also includes support service costs for headquarters employees. Of the $146.1 million requested in fiscal year 1987, $49.1 million is for salaries and benefits for 1,117 full-time equivalents and $2.5 million for related travel. The support services request of $94.5 million includes items such as space rental, supplies, transportation, communications, computer systems, printing, and the purchase of capital equipment. It should be noted that $6 milion of management and administration's request will be financed by prior-year deobligations, resulting in a budget authority request of $140.1 million.

OFFICE OF THE SECRETARY

The request for the Office of the Secretary includes $1.9 million for salaries, related expenses, and travel costs to support 31 full-time equivalents.

OPERATIONS OFFICES

Five of the eight operations offices are multipurpose and are, therefore, funded within the departmental administration appropriation. These are Chicago, Idaho, Oak Ridge, Richland, and San Francisco. Of the $94.2 million requested in fiscal year 1987, $66.8 million is for salaries and benefits for 1,601 full-time equivalents, $1.9 million for travel expenses, and $25.5 milion for space rental, utilities, supplies, transportation, communications, related support services, and capital equipment. These five multipurpose operations offices support research and development activities through contract administration and day-to-day management oversight of Government-owned, contractor-operated facilities; design, engineering and construction management; procurement; property and real estate management; contractor industrial relations; financial management; and management of related support services. The other three operations offices primarily support defense activities and are funded by the atomic energy defense appropriations. These are Albuquerque, Nevada, and Savannah River.

COST OF WORK FOR OTHERS AND MISCELLANEOUS REVENUES

Cost of work for others covers expenses for products and services to non-DOE organizations when such products or services are not generally available from alternate sources. Examples of such products and services include special reactor materials, isotopes, and irradiation and test reactor services. The fiscal year 1987 estimate is $115.1 million. The Department will receive an estimated $143.4 million in associated revenues as reimbursements for this work. Miscellaneous revenues estimated at $108.5 million are also earned from the sale of byproducts, such as reactor steam and reprocessing irradiated fuel.

IN-HOUSE ENERGY MANAGEMENT

The fiscal year 1987 request for in-house energy management is $16.5 million. The requested amount reflects a continuing investment to improve the energy efficiency of DOE buildings, facilities, and processes through quick payback projects. The program of retrofits proposed for fiscal year 1987 has a payback period of 2.2 years and a rate of return on investment of over 35 percent.

These retrofit projects reduce utility costs in the outyears for all DOE programs at the affected sites. The In-House Energy Management Program is centrally managed, which enables the Department to maximize the return on investment by competing projects DOE-wide on the basis of return on investment. The proposed funding also continues energy conservation surveys to identify future retrofit projects; central plant studies to evaluate the economic feasibility of cogeneration of electricity and other central plant improvements; and model energy conservation programs such as a Steam Trap Improvement Program for the Department's central steam distribution systems, and a boiler operator training program.

TECHNICAL INFORMATION MANAGEMENT PROGRAM

The Technical Information Management Program is a centralized scientific and technical information resources management function for the Department's program managers and contractors. The major responsibilities of this program are: (1) The development of specific DOE-wide policies, procedures, and guidelines for the management of DOE's scientific and technical information; (2) oversight and program evaluation responsibility to ensure that R&D information resources are effectively managed; (3) the management of an international program to allow the United States to capitalize on the availability of technical information generated through other nation's energy research and development; and (4) management of the Technical Information Center, DOE's centralized scientific and technical information facility. The fiscal year 1987 budget request for the Technical Information Management Program is $14.7 million, which includes $13.8 million for operating expenses and $0.9 million for the purchase of capital equipment. Of this $14.7 million, it is proposed that $3.9 million will be reprogrammed from prior-year unobligated authority, resulting in a budget authority request of $10.8 million. This request includes support for 175 full-time equivalents.

Mr. Chairman, that concludes my presentation. I will be happy to respond to any questions you or the subcommittee members may have.

STATEMENT OF JOHN C. LAYTON, INSPECTOR GENERAL, DEPARTMENT OF ENERGY

RESPONSIBILITIES

The statutory responsibilities of the Inspector General, as stated in section 208 of Public Law 95-91, the Department of Energy Organization Act, are to detect and prevent fraud and abuse and to promote economy and efficiency in the programs and operations of the Department of Energy [DOE]. These programs encompass the work of over 16,300 employees of the Department, 130,500 DOE contractor employees at Government-owned, contractor-operated facilities, and the activities of other contractors and grantees of the Department.

The Department of Energy is a complex and multimissioned Department with programs varying from the assembly of nuclear weapons to the funding of low-income weatherization projects. Further, the Department is second only to the Department of Defense in the dollar amount of its procurement activity. Thus, the audit, inspection, and investigative requirements of DOE are extensive and varied.

ORGANIZATION—AUDITS, INSPECTIONS, INVESTIGATIONS

The Office is organized in three divisions with three Assistant Inspectors General. The Office of Audits performs all internal audits for the Department. The Office of Audits conducts financial and compliance, efficiency and economy, and program results audits. The Office of Investigations is responsible for the detection and prevention of fraud and abuse. The Office of Inspections is responsible for reviewing and evaluating DOE's scientific and technical programs and operations. In addition, an Office of Executive Director performs administrative, personnel, policy, planning, and management information functions for the Inspector General.

The field structure for the Office of Audits is composed of an eastern (Oak Ridge) and western (Albuquerque) regional office with 11 satellite offices, and the Capital regional office, located in Germantown, Md. The field structure for the Office of Investigations is composed of regional investigative offices at Oak Ridge and Albuquerque with nine satellite offices. This organization places at least one investigator at each of the Department's operations offices.

The Inspector General began using private contractors to perform audit services in fiscal year 1983. In that year, the first fixed-price contracts were awarded for financial and compliance audits of the Department's integrated contractors. Expansion of the use of outside contractors was made in late fiscal year 1984 when additional contracts were awarded to enhance the Inspector General's ability to provide other needed contract and internal audit services. The fiscal year 1986 budget includes $3.7 million for these audit services with an increase to $5.8 million included in the fiscal year 1987 budget request.

In addition, extensive use is made of the Defense Contract Audit Agency [DCAA] to audit DOE contracts where that organization has audit cognizance. The estimated cost of the DCAA audit services, as included in the budget request, is $5.6 million in fiscal year 1986, decreasing to $4.5 million in fiscal year 1987.

ACCOMPLISHMENTS

The Office of Audits completed its first full year of using the services of contractors to augment its full-time staff and perform all types of audits within the Department. The substantial commitment of resources that had been made to prepare for this innovative approach to partially accomplishing the Office's internal audit mission proved to be a good investment as productivity improved appreciably throughout the year. For example, the Office issued 161 reports in fiscal year 1984 and reported $16 million as potential savings resulting from audit recommendations. During fiscal year 1985, the Office issued 200 audit reports with recommendations which could result in potential savings of over $40 million. It is expected this growth in the number and the impact of audit reports will be sustained for the foreseeable future as the contractors gain more internal audit experience and become more familiar with the Inspector General's audit procedures.

In addition to these audit accomplishments, a number of initiatives were undertaken to assure quality work and effective management of the contractors.

—A comprehensive management information system was developed.

—An exhaustive resource analysis study was concluded which better identified the audit universe and produced an assessment of the audit resources required to provide adequate audit coverage of the Department's activities.

—The third fully integrated annual work plan for all audits to be done within the Department was published.

In addition, five manuals providing audit guidance were published. These were:

1. An audit report manual designed to ensure the production of uniform, concise, accurate, and professional audit reports;
2. A contract audit manual providing all policies to be used as guidelines in conducting contract and grant audits;
3. A post-award contract management guide providing the procedures for technical administration of the contracts;
4. An integrated contractor audit manual providing guidance for the conduct of cyclic audits of the Department's Government-owned, contractor-operated operations; and
5. A procedures manual for audits of federally assisted programs providing guidance on the administration and conduct of audits done of grants awarded by the Department.

The Office of Inspections directed its efforts toward the evaluation of the Department's scientific and engineering programs and projects. In this effort they had substantial success. For example, one inspection addressed facilities revitalization projects at Sandia National Laboratory. Almost $127 million in new facilities was proposed for weapons research and development upgrades without considering less costly alternatives such as refurbishing or modernizing existing facilities. As a result of our report, the program office will require that facilities being requested after fiscal year 1986 will be fully justified in light of other alternatives, and further, that these other alternatives, and the reasons for which they were not selected, will be fully documented. The Office of Inspections also completed an inspection of nuclear safeguards and security at four DOE weapons facilities plus the Department's transportation system. Beyond the 97 actual findings that emerged and are in process of being corrected, we developed a unique methodology that will greatly impact future assessments in the allocation of some $2 billion in resources for improving security. Security personnel have indicated that this methodology represents a major contribution to their approach in addressing this complex problem, has already saved some development costs, and has the potential to introduce significant cost savings when integrated into their planned program for security upgrades.

The Office of Investigations continued its work on discovering and preventing waste, fraud, and abuse. During fiscal year 1985, 62 cases were referred to prosecutive authorities and other investigative agencies. Fifteen of the cases were accepted for prosecution. Moneys identified for recovery as a result of investigative cases totaled $166,994 and investigations resulted in four indictments and seven convictions (contractor employees).

The Inspector General has taken an active role in assisting the Department in meeting the requirements of the Federal Managers' Financial Integrity Act. The Inspector General is also a member of the Department of Energy's Internal Control and Audit Review Council. One of the purposes of the Council is to provide management oversight, to review the progress and make decisions about the deployment of resources to the Department's internal control efforts, and to advise the Secretary on the result of these efforts. We continue to work closely on cooperative efforts with the President's Council on Integrity and Efficiency—a combined program of the Inspectors General and the Office of Management and Budget.

The semiannual report covering our Offices' activities for the first half of fiscal year 1986 will be submitted to you in May 1986.

FUNDING LEVEL

The following is a description of the fiscal year 1986 adjusted appropriation and the fiscal year 1987 request:

	Fiscal year 1986 adjusted budget appropriation	Fiscal year 1987 ;budget request
Salaries/other compensation	$7,491,000	$8,041,000
Benefits	797,000	1,019,000
Travel	399,000	708,000
Support services	141,000	794,000
Contract auditors	3,747,000	5,780,000
DCAA	5,583,000	4,500,000
Capital equipment		250,000
Total	18,158,000	21,092,000

In fiscal year 1986 we have 178 FTE's and in fiscal year 1987 our request is for 178 FTE's.

The Office of Inspector General continues to make steady progress in fulfilling its mandate to detect and prevent fraud and abuse and to promote efficiency and economy in the Department of Energy's programs and operations.

STATEMENT OF JOANN ELFERINK, ACTING DIRECTOR, OFFICE OF POLICY, PLANNING AND ANALYSIS, DEPARTMENT OF ENERGY

Mr. Chairman, members of the subcommittee, I appreciate the opportunity to appear before you today to discuss the fiscal year 1987 budget request for the Department of Energy's Office of Policy, Planning, and Analysis [PPA].

POLICY, PLANNING, AND ANALYSIS—ROLE AND RESPONSIBILITIES

The Office of Policy, Planning, and Analysis acts as a principal advisor to the Secretary for formulating and recommending national energy policy and carries out analyses of DOE programs to aid them in maximizing their contribution to the achievement of national energy policy objectives. PPA provides analyses of policy issues, develops policy proposals, and coordinates these initiatives within the Department and the executive branch. The Office concentrates upon strategic planning issues, analysis of potential policy options, and analytical efforts required for policy development. PPA provides the Secretary with an objective policy analysis and evaluation capability.

An important policy statement which PPA oversees is the national energy policy plan [NEPP]. As described in the NEPP, the goal for all of the Department's energy policy actions is to foster an adequate supply of energy at reasonable costs. PPA's analytic, advisory, and coordinating activities are undertaken in support of this goal and are designed to assure that DOE activities encourage energy stability, security, and strength by pursuing strategies to minimize Federal involvement in energy markets while maintaining public health and safety and environmental quality; and to promote a balanced and mixed energy resource system.

OBJECTIVES AND GOALS

Within the framework of the NEPP, specific objectives for fiscal year 1987, formulated in response to sections 102, 203, 657, and 801 of Public Law 95-91, the Energy Organization Act, are:

- Analyses of policy-related energy topics of congressional, Presidential, and secretarial concern; and
- Further development and implementation of an analytical framework for energy policy, improvement of analytic capability, and expansion of in-depth analyses to provide knowleldge for areas of current and potential energy policy concern.

The major goals of the Office of Policy, Planning, and Analysis are:

- Early and accurate identification of major energy policy issues that need to be addressed through long-term studies and analyses.
- Continued development, analyses, and evaluation of specific policies and programs, both in response to congressional and Presidential mandates, and in fulfillment of more general responsibilities of the Office and the Secretary.
- A program of fundamental, long-term studies of the nature, causes, and potential solutions of the Nation's energy problems, designed to lead to improved insights and to form the basis for innovation and improvement in the Nation's energy policies and programs.

ACCOMPLISHMENTS

Significant accomplishments during the past year include:

- Completed the second report required by section 123 of the Natural Gas Policy Act of 1978.
- Prepared DOE's comments on FERC's notice of inquiry on interstate transportation of gas and on FERC's notice of inquiry on natural gas pipeline ratemaking, risk, and financial implications after partial decontrol.
- Completed phase 1 of study on "Economic Analysis of Electricity 'Rate Shock'."
- Completed intial analysis of effects of partial deregulation of railroads on coal transportation costs and electric utility prices.
- Completed technical and economical analysis of automotive fuel economy issues.
- Prepared detailed analysis of energy use trends in the U.S. economy from 1972 to 1984. Results presented in national and international forums.
- Completed a study of the economy's response (in terms of energy use and efficiency) to economic growth and changing energy prices.
- Completed a multiyear project with the National Academy of Science on behavorial aspects of energy consumption.
- Initiated an analysis to project fuel shares (focusing on oil and electricity) in the residential and industrial sectors for the period 1985-95.
- Prepared energy projections portion of the U.S. submission to the International Energy Agency Standing Group on Long-Term Cooperation [IEA/SLT].
- Prepared analyses of the costs and benefits of alternative acid rain control strategies, including utility coal conversions.

- Prepared the NEPP V required under section 801 of the DOE Organization Act.
- Completed study assessing the economics of selected first-generation commercial nuclear powerplants.
- Analyzed effects of Federal regulations on utility decisions to cancel partially built nuclear powerplants.
- Completed study of the comparative economics of electric generating facilities as a function of size.
- Completed development of the motor fuel consumption model which analyses consumption trends for automotive fuels for the 1980–95 period.

1987 BUDGET REQUEST

The fiscal year 1987 request reflects a continuation of the kinds of policy initiatives which have been supported historically by the Department of Energy as a cabinet-level agency. This request fully supports the goals and strategies set forth in the national energy policy plan.

The requested level of funding is $7,855,000. The fiscal year 1987 request includes funding for two primary program elements—policy analysis and system studies and program direction. A breakout is shown below.

BUDGET REQUEST

	Fiscal year 1986 adjusted appropriation	Fiscal year 1987 request
Policy analysis and system studies	$4,243,000	$4,500,000
Program direction	$3,205,000	$3,355,000
Total	$7,448,000	$7,855,000
Total FTE's	64	64

PPA's request for policy and system studies is $4.5 million. This request will continue to provide a high-quality level of both short- and long-term studies and analyses. Results from these studies are important for the development of energy policy in an orderly way. In addition to short- and long-term studies, efforts will be directed toward continuous monitoring, analyzing, and forecasting of the Nation's energy production, supply, and markets.

PPA's request for program direction is $3,355,000 which provides funding for salaries, benefits, and travel expenses to support 64 FTE's. The primary functions of the PPA staff are: Review, analysis, and development of options for the Secretary on the full range of energy policy issues. Analyses typically are quantitative in nature, focusing on macro- and micro-economic impacts of alternative policies on U.S. and world markets. Substantial effort is made toward identifying emerging energy policy issues for early resolution.

The budget request corresponds to the responsibilities of PPA under its mission statement. It provides manpower resources to perform its specific functions in areas critical to the continued implementation of administration energy policy and in fulfillment of congressional mandates. It also provides acceptable levels of policy analysis and evaluation support to the Secretary, the Congress, and the President.

Mr. Chairman, this concludes my formal presentation. I would be happy to answer any questions you may have.

STATEMENT OF GERALDINE P. FLOWERS, DEPUTY DIRECTOR, OFFICE OF MINORITY ECONOMIC IMPACT, DEPARTMENT OF ENERGY

Mr. Chairman, members of the subcommittee, I am Geraldine P. Flowers, Deputy Director, Office of Minority Economic Impact [MI]. I appreciate the opportunity to discuss the MI budget request for fiscal year 1987.

MI was established in November 1978, pursuant to section 641 of the National Energy Conservation Policy Act (Public Law 95–619). Its legislative mandate is to advise the Secretary of Energy on the impact of the Department's energy policies, regulations, and programs on minorities, and to undertake program activities that would ensure that minorities and minority businesses are afforded an opportunity to participate fully in the Department of Energy's programs.

To assure participation in DOE's program activities at all levels, MI is responsible, within the Department, for a number of ongoing minority program activities in three major categories. The categories are socio-economic research, management and technical assistance, and financial assistance. Research activities include the updating and maintenance of the regional minority data bank and improvements of the capabilities of the minority energy assessment model [MEAM]; providing socio-economic and other information and related analyses for specific policy and programmatic efforts within DOE and relevant Federal agencies at the regional level; and identifying and defining economic opportunities for minorities in various segments of the energy industry through economic analyses, feasibility studies, and other technical assistance.

The activities in the management and technical assistance area are a Minority Economic Development Program, an Honors Vocational Training Program in energy-related technologies, a minority energy information clearinghouse effort, and a Minority Educational Institution Assistance Program. The Institutional Assistance Program is designed to encourage the development of an increased research infrastructure at minority institutions. MI is responsible for coordination of the Department's implementation of Executive Order 12320, the historically black college and universities initiative [HBCU]. DOE program awards to the HBCU's in fiscal year 1985 increased to $8,074,534, compared to $1,899,000 in fiscal year 1982. This increase enhances DOE's potential to assure a broad base of research and development at our minority educational institutions.

There are two programs in the financial assistance category. They are the loan program which is set forth in Public Law 95-619, and the Minority Financial Institutions Development Program. The latter program is designed to help minority financial institutions make loans and investments in the communities they serve by providing a stable deposit base in the form of certificates of deposit from consent order funds.

The MI request for fiscal year 1987 is $1,789,000. The following table provides a more detailed breakout:

[In thousands of dollars]

	Fiscal year 1986	Fiscal year 1987
Research program	$589	$765
Management and Technical Assistance Program	1,477	[1]435
Financial Assistance Program		(2)
Program direction	530	589
Total	2,596	1,789

[1] A deferral of $393,000 from fiscal year 1986 for the Minority Educational Institution Assistance Program will be utilized in fiscal year 1987 to enable continuation of this program for the second year.

[2] Funded from the fiscal year 1986 carryover balance.

FISCAL YEAR 1987 BUDGET HIGHLIGHTS

In research, MI will:

- Continue to incorporate national and regional economic, residential, and transportation data and increase the level of minority representation information; enhance the minority energy assessment model's capability by updating and incorporating new modeling methodologies and options.
- Continue to incorporate special impact and economic studies, data, and analysis on minorities into assessments for DOE legislative and regulatory actions and in the formulation of policy and programmatic options.
- Continue to focus on market research and financial planning analysis to provide

minority businesses with information to assist in their planning efforts to assess business potential in specific new energy technologies.

In management and technical assistance:

- The minority educational institution assistance direct support will continue to provide for a core cadre to start up operations of science and technology research and development centers. These centers will provide an administrative infrastructure vital to moving the minority institutions into a fully competitive posture. General technical support and research travel support will be provided to non-research-oriented minority institutions. Activities to enhance private sector interaction will continue.
- Focused technical assistance will continue to be provided to minority businesses. Outreach activity and data collection will be the basis for providing advice to the Secretary. Assistance will be furnished to DOE officials on ways to increase minority business enterprise participation.

In fiscal year 1986, some of the planned accomplishments include the following:

SOCIO-ECONOMIC RESEARCH AND POLICY ASSESSMENTS

- To augment the data bank development, some limited regional-based information will be added from other sources of data information in order to (1) improve the quality of the data, (2) update the socio-economic and energy use patterns information, and (3) to facilitate relevant forecasting of residential and transportation energy demand for appropriate impact assessments.
- The methodology of the Minority Energy Assessment Model [MEAM] will be modified to reflect compatibility with end-use characteristics and regional-based data.
- Specific socio-economic and energy-use information will be developed from the data bank and provided to the policy office and to relevant program offices so that in-depth analysis at a more micro level can be facilitated by the availability of data and other comparative information, specific minority categories at the regional level.
- A technical information document and regional market penetration information designed to assist minority businesses to identify and define economic opportunities and financial options in various segments of the energy industry will be developed and disseminated.

MANAGEMENT AND TECHNICAL ASSISTANCE

- Support the establishment of energy research centers at minority institutions.
- Develop and support innovations in private sector partnerships with minority educational institutions.
- Continue to advise the Secretary, through the Minority Economic Development Program, about the impact of energy activity on minority business enterprises [MBE's], and develop ways to assure MBE's are afforded an opportunity to participate fully in the energy programs of DOE. This program makes a concerted effort to seek out, encourage, and provide technical assistance to small and large disadvantaged businesses, and it assists departmental officials in increasing the participation of disadvantaged businesses in DOE activities.

FINANCIAL ASSISTANCE PROGRAM

- Will evaluate recommendations arising from the program evaluation study of the loan program conducted during fiscal year 1985.
- Will commence to implement the relevant recommendations contained in the aforementioned study.
- Will continue to provide loans and possibly other financial assistance to minority business enterprises.

MINORITY FINANCIAL INSTITUTIONS DEVELOPMENT PROGRAM

- Will continue to administer the Minority Financial Institutions Development Program, implementing the approved increase in deposit levels in minority banks from $400,000 to $500,000 per bank.
- Will seek approval to increase deposit levels in minority thrift institutions from $200,000 to $500,000 per institution.
- Approximately $60 million in consent order funds will be on deposit in 160 minority financial institutions. This effort will continue to be funded from DOE's petroleum violation escrow account, and not with MI appropriated funds.
- Will continue to provide for administrative support for the Minority Financial Institutions Development Program.

Mr. Chairman, this concludes my remarks. I would be happy to answer any questions which you or the members of your subcommittee might have concerning the programs of the Office of Minority Economic Impact.

BIOGRAPHICAL SKETCH OF GERALDINE P. FLOWERS

Geraldine P. Flowers was designated Deputy Director, Office of Minority Economic Impact, U.S. Department of Energy [DOE], in January 1986. In this position, she is responsible for advising the Secretary of Energy on the effect of energy policies, regulations, and programs on minorities and minority business enterprises.

Ms. Flowers has served as Director, Personnel Policies and Programs Division, Office of Personnel, DOE, since 1978. She is responsible for providing technical and administrative direction to the staff of the Division in establishing personnel management policies and programs for the Department.

Ms. Flowers' previous work experience includes: Chief, Employee Programs, Atomic Energy Commission and Energy Research and Development Administration, from 1973 to 1978; personnel officer, Federal Railroad Administration, Department of Transportation, from 1972 to 1973; personnel officer, Cost of Living Council in 1972; position classification specialist and personnel management specialist, Department of Transportation, from 1969 to 1972; and personnel specialist, U.S. Information Agency.

Ms. Flowers is a charter member of the Senior Executive Service. She received the DOE Energy Exceptional Service Award in 1986; she also received SES performance award bonuses for accomplishments in 1981 and 1984; in 1976 she received a special achievement award for equal employment opportunity; and in 1974 she was a William A. Jump Award nominee.

STATEMENT OF THEODORE J. GARRISH, ASSISTANT SECRETARY, CONGRESSIONAL, INTERGOVERNMENTAL AND PUBLIC AFFAIRS, DEPARTMENT OF ENERGY

Mr. Chairman and members of the subcommittee, I appreciate this opportunity to discuss the fiscal year 1987 budget request for the Office of Congressional, Intergovernmental and Public Affairs.

As in the past fiscal year, the responsibilities of this Office remain as multifaceted as they are demanding. Among the principal mandates and concerns of this Office are the management and coordination responsibilities in keeping the Congress fully and currently informed of departmental activities. In addition, we are responsible for relations with a variety of energy-interested constituencies—and communications with the public-at-large. These constituencies include the news media; State, territorial, tribal, and local government officials; other Federal agencies; consumer, citizen, labor, and business organizations; nonprofit education organizations, and other energy-oriented groups.

This Office is also responsible for fostering and promoting competition in the energy industry. Finally, it serves in a support and advisory role for other DOE components and in efforts to work toward the implementation of national energy policy goals.

FISCAL YEAR 1987 BUDGET REQUEST

While the responsibilities of the Office of Congressional, Intergovernmental and Public Affairs remain unchanged, the budget request for fiscal year 1987 is $4,915,000, a decrease of $201,000 from fiscal year 1986. This savings is achieved through reduced contractual support.

Our fiscal year 1987 budget request calls for $4,409,000 for program direction, a funding level sufficient to maintain 88 FTE's, the same level as fiscal year 1986. This amount is necessary to maintain staffing levels that will enable us to carry out the Office's wide range of responsibilities.

A total of $506,000 is requested for program support. These funds are needed for support in the press services area, for the evaluation of audiovisual products and publications, and for the dissemination of consumer energy information through radio spots and bimonthly news columns. Funding is also requested for contractor analysis of energy competition issues and to assist in development of Indian energy resources.

Mr. Chairman, inasmuch as this subcommittee has requested that this testimony include a discussion of fiscal year 1986 activities and accomplishments, I would like to touch briefly on our ongoing projects for the remainder of this fiscal year. I believe you will find that they justify our fiscal year 1987 budget request and mirror the fact that this Office is an integral part of the Department of Energy—and an important conduit for the Department in implementing the National Energy Policy Plan [NEPP].

FISCAL YEAR 1986 ACTIVITIES

During the remainder of the fiscal year, this Office's activities will be focused on:

- Coordination of departmental efforts related to the consideration and passage of new and revised legislation in areas such as Superfund reauthorization, acid rain/clean air concerns, nuclear licensing reform, Price-Anderson reauthorization, energy defederalization, and energy tax incentives.
- Continued efforts to maintain effective communication with the public in order to provide information on energy policy and programs.
- Participation in the development and implementation of energy programs, specifically nuclear waste management and emergency preparedness, with a special emphasis on outreach to State and local governments—and related constituencies.
- Other ongoing coordination of DOE activities in other areas with State and local governments as well as business, labor, and industry, and education and consumer-oriented organizations.
- Promotion of the development of Indian energy resources through an interagency contract managed by DOE with the Council of Energy Resource Tribes.

Mr. Chairman, I believe the record of service, accomplishment, and advocacy provided by the Office of Congressional, Intergovernmental and Public Affairs during the past fiscal year fully substantiates its fiscal year 1987 budget request. The following table summarizes the fiscal year 1986 funding level and the fiscal year 1987 request:

[In thousands of dollars]

	Fiscal year 1986	Fiscal year 1987
Program direction	$4,240	$4,409
Program support	876	506
Total	5,116	4,915

Let me close by saying that it has been a great privilege and pleasure to work with the Congress during this past year. I look forward to a continuing and productive relationship.

STATEMENT OF GEORGE J. BRADLEY, JR., ACTING ASSISTANT SECRETARY FOR INTERNATIONAL AFFAIRS AND ENERGY EMERGENCIES, DEPARTMENT OF ENERGY

Mr. Chairman, Members of the Subcommittee:

It is a pleasure to present testimony before this Subcommittee on the FY 1987 budget request for the Office of International Affairs and Energy Emergencies. I shall be discussing only that portion of our request which supports the Office of International Affairs, and the Policy and Management, IE line item, which includes my immediate office and my Management Services administrative support staff.

PROGRAM AUTHORIZATION GOALS

Reliance on the market is the cornerstone of our National Energy Policy Plan (NEPP-IV), which President Reagan submitted to the Congress in October 1983. The goal of that plan is an adequate supply of energy at reasonable costs. Let me reiterate our strategies for achieving that goal.

First, we seek to minimize Federal Government intervention in the energy markets, recognizing our responsibility for health, safety and environmental matters. Our second strategy is to promote a balanced and mixed energy system. Together, the goal and strategies provide the framework in which we have developed our international policies.

The overall policy role for International Affairs is established by the Department of Energy Organization Act of 1977 (P.L. 95-91). This Act requires the Department to develop and implement international energy policy consistent with domestic energy and U.S. foreign policy and to provide independent technical advice to the President on international energy-related matters. In accordance with the National Energy Policy Plan, our program is focussing on the international dimensions of energy supply, energy security, and emergency preparedness. Our primary international energy goals are to reinforce the international nuclear nonproliferation regime; to advise on policies to remove impediments that hinder international energy trade markets; to improve U.S. accessibility in world energy markets, primarily nuclear, coal, oil and gas; to help shape policies that reduce U.S. vulnerability to energy supply disruptions; and to encourage and facilitate increased international collaboration in energy research and development (R&D) to increase the efficiency and productivity of the R&D investment in the technology options available for long-term energy security.

A major initiative related to reinforcing our energy security is the Department's initiative in enhanced collaboration in international research and development. In an era of declining financial support for energy R&D, enhanced collaboration offers an opportunity to maintain momentum of priority research activities. It emphasizes early consultation at the planning and project development stage of high priority energy R&D programs, which helps facilitate substantive collaboration. It also promises improved economic efficiency and an accelerated pace of technological development over and above that which would otherwise be achieved.

The Office of International Affairs (IA) has a unique role in developing the policy and strategy for enhanced collaboration as well as negotiating with senior foreign energy policy officials on the political scope of such new arrangements. This role is significantly different from the technical discussions with foreign partners undertaken at the programmatic level.

An internal task force on international R&D collaboration comprised entirely of technical program office personnel clarified the roles and responsibilities between IA and the program offices. Their findings clearly indicated that IA has policy, administrative, and management information responsibilities that are unique to IA and does not duplicate program office activities. An expansion of those responsibilities was recommended.

An Energy Research Advisory Board (ERAB) study on international R&D collaboration recommends an even stronger role for IA, building upon its unique capabilities and responsibilities. Those who have carefully studied the situation recommend increased funding for policy studies.

The IA studies provide us with the intellectual capital to formulate R&D collaboration policies consistent with overall foreign policy to improve our ability, to understand foreign country energy technology programs within the context of their overall energy policy, to develop strategies that will ensure that our international collaboration activities will provide significant benefits to this country, and to develop negotiating positions for bargaining with specific countries, including possible multiple technology arrangements.

INTERNATIONAL AFFAIRS PROGRAM ORGANIZATION

The work of the International Affairs program is carried out by three organizations reporting to the Deputy Assistant Secretary for International Affairs. The organizations are:

The Office of International Energy Analysis

This office is responsible for providing in-depth analyses of trends in world energy supply, demand, and trade with particular emphasis on policy implications; and for managing and coordinating the international aspects of DOE/U.S. participation in energy security planning and programs. The office also coordinates and implements policies regarding U.S. participation in the International Energy Agency (IEA), and NATO, and monitors the discussion of energy policy issues within the European Community. In addition, the office coordinates bilateral exchanges of views on national energy policy goals and objectives at the technical and Ministerial levels with other countries.

The Office of International Research and Development Policy

This office is responsible for coordinating DOE participation in international energy research and development collaboration activities; coordinating and implementing policies and activities regarding bilateral and multilateral scientific and technological collaboration; and developing policies for related technology trade issues. The office also emphasizes the development of priorities for DOE international R&D efforts, negotiates umbrella agreements and provides expertise for specific R&D program negotiations.

The Office of Nuclear Nonproliferation Policy

This office is responsible, in coordination with the Department of State, for developing and implementing U.S. nuclear nonproliferation policies. Duties include implementing the statutory responsibilities for "subsequent arrangements" under the Nuclear Non-Proliferation Act, supporting the Department of State in the negotiation (and renegotiation) of Agreements for Civilian Nuclear Cooperation, and coordinating DOE's positions on, and financial support of, the International Atomic Energy Agency's (IAEA) programs. The work of this office is closely coordinated with the Office of International Security Affairs in the Department's Office of Defense Programs.

FY 1987 BUDGET REQUEST

The FY 1987 budget request for International Affairs is $5,080,000, an increase of approximately $1,141,000 from 1986. At this level, 51 full-time equivalents (FTEs) are funded, the same as in FY 1986. Requested funding shown below under Program Direction provides for the salaries, benefits, and travel for International Affairs' employees. Also, funds are requested to conduct International Policy Studies. The budget summary is provided in the following:

($ In Thousands)

	FY 1986 Appropriation	FY 1987 Request
International Policy Studies	$ 963	$1,700
Program Direction	$2,976	$3,380
Total IA Operating Expense	$3,939	$5,080

The FY 1987 budget request for International Policy Studies is $1,700,000, an increase of $737,000 from 1986. This requested increase in funding is targeted to contribute to the achievement of the Administration's goal of enhancement of the energy security of the U.S. and its allies by increasing the level of international collaboration in energy R&D and thereby increasing the effectiveness of DOE's R&D investments.

Funds will be used to provide technical and analytical support for international R&D coordination and facilitation; provide analyses of recent successful international cooperation activities; gather information on foreign energy R&D programs and opportunities for future joint energy-related projects; develope a process for early joint planning on a program level, leading ultimately to collaborative activities; focus on multilateral R&D cooperation opportunities under the Committee on Research and

Development of the International Energy Agency (IEA), the Nuclear Energy Agency (NEA), and the International Atomic Energy Agency (IAEA) organizational umbrellas; and establish management information systems to monitor DOE foreign travel, foreign visits and assignments to the U.S. and status of agreements, negotiations and discussions for R&D collaboration.

In the area of international energy analysis, funds will be used to study such areas as energy trends in China and the Pacific Basin; changes in the international oil market structure and energy trade policies; and the utilization of natural gas resources in developing countries.

In the nuclear nonproliferation area, funds will be used for follow-on support for the 1985 Nuclear Non-Proliferation Treaty Review Conference, and for other nuclear nonproliferation issues.

FY 85/FY 86 ACCOMPLISHMENTS

The following are among the major accomplishments of the Office of International Affairs:

- Represented the United States at the International Energy Agency (IEA) in achieving an agreement by IEA Ministers on a common approach toward such issues as gas security and oil product imports.

- Negotiated, in conjunction with the Department of State, the successful conclusion of Agreements for Cooperation for Civil Uses of Atomic Energy with China and Finland that will allow the export of U.S. material, equipment components and U.S. reactor technology.

- Negotiated with foreign governments the establishment of new administrative arrangements required under Agreements for Nuclear Cooperation and initiated new procedures.

- Approved more than 150 "subsequent arrangements" for the transfer of nuclear material while improving the control mechanism.

- Continued progress on the renegotiation of Agreements for Nuclear Cooperation with Japan and EURATOM as directed by the 1978 Nuclear Nonproliferation Act (NNPA).

- In cooperation with the Department of Commerce, laid the groundwork for the President's decision on June 14, 1985 to remove restrictions on crude oil exports to Canada. This action was taken in response to a similar decision by Canada to deregulate crude exports to the U.S.

- Developed the policy framework and rationale for removing restrictions on the export of Alaskan Cook Inlet crude oil to the Far East. This action could involve the export of up to 30,000 barrels per day of crude.

- Provided policy and technical support throughout the Government on international gas issues, including the Spanish proposal for a natural gas pipeline from Africa to Europe and development of Western European gas supplies.

- Provided protocol support for the Secretary of Energy and other senior DOE management for visits by foreign energy officials and visits abroad by U.S. officials.

- Devised a strategy to seek to achieve optimal use of energy R&D resources here and abroad. A process of international collaboration was promoted and discussed among certain key countries. Under this process, interested countries would share and compare their program plans in various technical areas of energy R&D while they are still being developed, and adjust them accordingly to take full advantage of each other's capabilities. These recommendations encourage early consultation in the design of program plans, as well as periodic monitoring of progress in collaborative energy R&D at the political level.

- Managed and administered over 130 cooperative energy R&D technical exchange agreements and other commitments, covering more than 260 projects, with foreign nationals and international organizations including the IEA, the Nuclear Energy Agency (NEA), and the International Atomic Energy Agency (IAEA).

- Drafted and negotiated 48 new technical exchange agreements and 28 extensions of existing technical exchange agreements. A total of 14 foreign countries were involved. Technical fields include nuclear energy, radioactive waste management, enhanced oil recovery, natural gas, geothermal, solar, nuclear physics and coal.

FY 87-89 OBJECTIVES

- Promote and coordinate expanded international collaboration in energy research and development by DOE with other countries in order to maintain scientific progress and optimize the utilization of available scientific resources.

- Secure support for enhanced international R&D collaboration outside the Department by briefing other Executive Agencies and Congressional staffs, committees and offices on the objectives to be achieved and the policy rationale.

- Promote a technical base for the implementation of a Western policy framework to encourage the development of alternatives to Soviet Gas, including ensuring and monitoring our energy commitment to the IEA and implementing specific gas emergency measures.

- Promote the free market in bilateral and multilateral energy relations through, for example, the removal of trade barriers, as the best way to create an environment that will best ensure adequate supplies at reasonable prices.

- Analyze political, economic and energy developments and trends in international markets in order to identify emerging issues which will effect U.S. international energy security interests.

- Promote enhanced cooperation and a more intensive energy policy dialogue with key Asia-Pacific countries in order to strengthen the energy security of this region and prospects for greater U.S. energy exports.

- Continue the historical commitment to maintain and strengthen the international nonproliferation regime. International Affairs considers nuclear nonproliferation one of its primary statutory responsibilities and will continue to exert its best efforts to assure protection against the spread of sensitive nuclear technologies.

- Continue support of U.S. efforts to enhance the viability of the Nuclear Nonproliferation Treaty through increased coordination with other agencies in providing technical assistance to other countries.

- Improve and enhance assistance to the IAEA in fields of technical cooperation with the Agency and in providing focused assistance to selected countries deemed to be of special importance for implementing the U.S. program.

Accomplishment of our objectives will: provide a sound analytical basis on which to conduct our energy relations with both oil producing and consuming nations; establish and maintain a dialogue with other countries on important global energy matters; enchance U.S. international energy research and development collaborative efforts; help reduce the risks of nuclear weapons proliferation while expanding the markets for the peaceful applications of nuclear energy; lessen U.S. vulnerability to energy supply disruptions; and provide accurate and reliable advice and support to the Secretary and other energy policymakers.

POLICY AND MANAGEMENT - IE

Along with the request for International Affairs is the funding for Policy and Management - IE. This includes salaries and expenses for the immediate Office of the Assistant Secretary for International Affairs and Energy Emergencies and the Management Services staff which performs administrative support functions for the IE organization. The FY 1987 request of $710,000 provides for 12 full-time equivalents (FTEs). Funds requested are for salaries, benefits and travel as well as approximately $100,000 for contractual support.

This concludes my statement. I will be happy to answer any questions.

Thank you.

STATEMENT OF J. MICHAEL FARRELL, GENERAL COUNSEL, DEPARTMENT OF ENERGY

Mr. Chairman and members of the committee, I would like to submit this statement for your consideration of the Fiscal Year 1987 budget request for the Office of General Counsel.

The Office of General Counsel provides the legal services necessary for the Secretary of Energy and the Department as a whole to accomplish their goals. These services cover the entire range of the Department's activities, with the exception of the Federal Energy Regulatory Commission. Our activities include legal counselling, legislative drafting, development of regulations, and the conduct of litigation. In addition, the office administers the Department's Standards of Conduct and Patent programs.

During the past year the office contributed to the Department's success in achieving numerous objectives. One of the most visible ways we have served the Government's interests is through litigation. Our attorneys, in conjunction with Department of Justice attorneys, have represented the Department and the Government in an increasing number of lawsuits. During the past year the Department has been directly involved in more than 300 cases, and indirectly involved in an additional 300 cases. Much of this litigation stems from claims of radiation injury. Currently there are more than 130 radiation related cases, involving over 5,000 plaintiffs and several billion dollars in claims.

We have been successful in key cases. One hundred and thirty-five claims for approximately $500 million dollars arising from nuclear weapons testing in the Pacific were dismissed by a federal court in California. That court also upheld the constitutionality of Section 1631 of the Department of Defense Authorization Act of 1985 which substitutes the U.S. for DOE contractors in all similar radiation cases.

Other significant successes not related to radiation include what is thought to be the largest civil judgment ever recovered by the government. The U.S. Supreme Court left standing a ruling that Exxon Corporation had overcharged consumers 815 million dollars for crude oil. The court ordered the money to be distributed among the states for use in energy conservation programs. Additionally, in January of this year, the Department, through court victory, saved from certain closure the nation's only coal gasification plant. The loans for the plant were guaranteed by DOE. After default on the loans by the plant operators, gas purchasers attempted to terminate their purchase contracts. In a suit filed by DOE to foreclose its interest in the plant, the Department succeeded in enforcing the gas purchase contracts which have permitted the plant to continue in operation and preserve the interests of the Department.

Another significant activity is our effort, in conjunction with the Economic Regulatory Administration, to conclude promptly and properly the remaining cases arising under the now-expired Emergency Petroleum Allocation Act's (EPAA) crude oil and petroleum product price control regulations.

Duplicative efforts between the Office of General Counsel and the Economic Regulatory Administration were eliminated and management of both litigation and the settlement process was improved through the consolidation of EPAA enforcement cases and the transfer of the General Counsel personnel responsible for those cases to ERA last year. The cases arising out of the Department's decisions to conclude the entitlements program will remain in the Office of General Counsel as do the personnel required to defend the Department's EPAA deregulatory actions.

Not only have we been successful in our litigation efforts to defend and pursue the Department's interests, we have also been able to promote efficient use of our budgetary resources. For example, by intervening in state level utility ratemaking proceedings affecting the Department's numerous facilities, we have succeeded in keeping the Government's utility costs as low as possible. Since 1981 such interventions have resulted in savings of 16 million dollars in annually recurring costs to the Government, and in $7.7 million in savings from nonrecurring costs. Pending rate cases could result in additional savings of approximately $11.25 million.

Although our litigation efforts are possibly the most visible means by which we provide legal support to the Department, other legal services which we provide may have an even greater impact over the longer term. For example, this office is actively engaged in facilitating the Department's participation in the legislative process. During this session of the Congress it is expected that bills will be considered concerning the Natural Gas Policy Act of of 1978, the Price-Anderson Act, and the President's defederalization initiatives. We will also be assisting the Department in reaching a position regarding Superfund reauthorization. We participated in a similar role last year with the Low-Level Radioactive Waste Policy Act.

The legal counsel this office provides also affects the conduct of the Department's most critical programs. In the nuclear area, we continue to be active in the implementation of the Nuclear Waste Policy Act of 1982 (NWPA). We assisted in the promulgation of guidelines under the NWPA for the Recommendation of Sites for Nuclear Waste Repositories and the preparation of draft Environmental Assessments for the nine possible sites. Other important objectives of the Department which were facilitated by our legal services include the completion of Environmental Impact Statements on the restart of the L-Reactor at our Savannah River facility and the disposal of decommissioned nuclear submarines.

The emergency preparedness activities of the Department continue to require our extensive support. During the last year we participated in the International Energy Agency's (IEA) Fifth Allocation Systems Test and successfully completed a million barrel test sale from the Strategic Petroleum Reserve (SPR).

A final area this office has devoted considerable efforts during the past year concerns regulatory reform. We attempt to minimize regulatory burdens while ensuring that accountability to agency goals is met. For example, we have been able to reduce greatly the recordkeeping formerly required pursuant to the Emergency Petroleum Allocation Act's allocation and price rules. We also provide program support to the Department in the wake of judicial findings regarding federal energy efficiency standards for eight major household appliances covered by the Energy Policy and Conservation Act.

In the future, this office will be pursuing a number of additional important objectives, such as completion of Environmental Assessments under the NWPA for the recommendation and nomination of three sites for characterization. In addition we will assist the Office of the Assistant Secretary for Defense Programs in initiating the upgrade of DOE's physical security programs for the protection of nuclear facilities, nuclear materials and classified information. This includes the development of policies and procedures on arrest and use of force.

Continued diligence and dedication to fiscal responsibility in the review of the Department's multi-billion dollar procurement program is another DOE objective. We will continue to devote considerable resources to the development of the Clean Coal Technology program, an effort to enter into cost-sharing projects with the private sector to demonstrate feasibility of the technology for future commercial applications. Additionally, we continue to support implementation of recent legislation and the President's patent policy to transfer Department-owned invention rights to contractors and thereby facilitate commercialization.

By ensuring that the activities of the Department are conducted in a manner which fully comports with the law, while avoiding the imposition of unnecessary requirements and burdens, this office has made significant strides in contributing to our national energy policy. That policy is to foster an adequate supply of energy at reasonable costs.

The FY 1986 appropriation is $9,715,000. Our budget request for fiscal year 1987 is $9,953,000. The FY 1987 request will provide $8.8 million for 166 FTE's and the remaining $1.1 million will be utilized for this office's support funding. In addition to the 166 FTE's, an additional 4 FTE's, to be funded from the Nuclear Waste Fund, are being requested for this office.

With this budget we believe we can continue to provide the professionalism in rendering legal services which this office has furnished to the Department since its formation.

OFFICE OF SECRETARY FUNDING REQUEST

Chairman HATFIELD. Madam Secretary, I am sure the record has it in some part, at least during the confirmation, that your duties and responsibilities would be rather monumental in your role as the Assistant Secretary for Management and Administration. You have direct or oversight responsibilities for $22 billion a year and 135,000 Government or contract employees, which is a very, very major responsibility, and I want to commend you on the special way in which you have been conducting your office. The questions that I have in no way reflect other than my deepest admiration for your capabilities.

But I do want to pursue some budgetary items which relate to a 16-percent, as we calculate it, a 16-percent increase in funding for the Office of the Secretary of the Department.

My figures also indicate that there is about a 14-percent increase in travel budget; a small item relating to the staff, and that is a $2,000 item, a very small item, for special training programs.

These are only examples of what we see as rather significant increases and wondered if you could elaborate on the reason for these increases in the Office of the Secretary.

Ms. HESSE. Yes, Mr. Chairman.

Essentially, the request for fiscal year 1987 for the Office of the Secretary is the same as the pre-Gramm-Rudman fiscal year 1986 request. As you know, the overall Department of Energy budget is increasing. Also, the Office of the Secretary's staffing is relatively inelastic; that is, it pretty much needs to remain the same.

We have unobligated carryover dollars from previous years that we intend to use in fiscal year 1986, so that in reality, there will be no increase in funding for the Office of the Secretary from fiscal year 1986 to fiscal year 1987.

In fact, the number of employees has been decreasing since 1981.

Chairman HATFIELD. I wonder if you could supply the committee with a comparison of the levels of funding of the Office of the Secretary when you made those requests initially within the Department—the first step of your budget review. Then carry that through the OMB and now, as compared to the figures that we have presented here.

Why I ask that question is that, historically, OMB has tended to reduce the agency or Department's request levels, especially in the field of administration, and I am just interested in knowing if that follows in this particular case. Really, in some part, it ties back, again, to one of the questions I asked Secretary Herrington relating to the perceived shift, as well as the actual budgetary shift of the Department from more of a civilian orientation to a military direction.

I think these figures here would also assist us in understanding that, if it is a type of policy that is expected to be followed.

I suppose in part, also, it seems that with military spending, this administration knows no particular limits of wish lists and energy to advocate and promote increased expenditures, and then for nonmilitary programs; almost conversely, there doesn't seem to be any limit to how far they are willing to go to destroy or eliminate, terminate, or reduce programs.

I have had a growing concern over a number of years and over a number of administrations that in terms of financial resources, in terms of natural resources, in terms of human resources, that we could be starting down a road of militarizing our whole economics of this country, and I need not engage in a long soliloquy on that issue at this point, but I do feel that it is one of those things that, like so many things in Government, happens suddenly at first, and then before we realize it, we are committed to a policy or a direction that I am not sure we really want to be.

That is the background of my questions relating to some of these increases and comparing the budget request with your request to OMB.

[The information follows:]

FUNDING REQUEST FOR THE OFFICE OF THE SECRETARY

The Office of the Secretary's fiscal year 1987 budget request to the Office of Management and Budget was $2,056,000 and the budget request to Congress is $1,860,000.

OFFICE OF MINORITY ECONOMIC IMPACT

Chairman HATFIELD. Following up on that, I note that the Office of Minority Economic Impact, specifically the Minority Honors Training

Program is being cut substantially. Yet, last year the testimony was that this was an excellent program and had been highly successful. The term "impressive," the term "excellent" was used to describe the fact that over 700 financially needy minority honor students had received scholarships for tuition, books, tools, laboratory fees, and of the 190 graduates in the program, 150 had been placed into jobs, or 79 percent. We expect this excellent placement figure to improve to approximately 82 percent, with the recent August–September 1984 graduates being placed into jobs.

I see that as, first of all, a question as to whether or not that is your view of the program as it has been performed up to this point, and if so, then why do we propose to cut substantially the Honors Training Program?

Ms. HESSE. Mr. Chairman, it is my view that this particular program has been very successful, and we are very proud of the accomplishments of this program. We also believe that we have done enough work in helping the schools to set up their own programs that we could now focus on a 4-year program as opposed to a 2-year program, and if so, the funding for 1987 is requested for a 4-year training program project.

We hope that it will be as successful as the 2-year program.

Chairman HATFIELD. One of our questions for the record will ask you to give us the list of the nine, I believe, colleges that have participated in this program and the level of funding for 1986 and 1987 to get a comparison, again, of those, and any other detail that relates to the Minority Training Program.

ADDITIONAL PREPARED QUESTIONS FOR THE RECORD

I have some other questions. I must move on now to, hopefully, get the full committee to report out a Commodity Credit Corporation supplemental. But we will submit these other questions for the record and would like your earliest possible response to them.

I also want to take special note, too, of the assistance you gave to the university projects in the matter of categorizing them as rescissions, which is very helpful, and we are very grateful for that kind of sensitivity and that kind of response to those requests.

Ms. HESSE. Thank you, Mr. Chairman.

Chairman HATFIELD. Thank you very much.

[The questions and answers follow:]

QUESTIONS SUBMITTED BY CHAIRMAN HATFIELD

Strategic Defense Initiative

Question: It appears from this enormous increase in funding that what the President continues to refer to as a "non-nuclear defensive system" may clearly be a nuclear system and could usher in a new generation of nuclear weapons. What is your view?

Answer: DOE SDI activities include both research on nuclear directed energy weapons concepts and nuclear power sources. The President's policy for SDI is a truly effective nonnuclear defense and this Department unconditionally supports this policy. The primary reason that we are pursuing nuclear directed energy weapons research is to understand the Soviet's capability to design and deploy similar weapons which would put the United States strategic deterrent force or a future defensive system at risk. These data are required as soon as possible because of the potential impact they could have on current nonnuclear SDI research and planning. In addition, the Department of Energy is conducting research on nuclear isotope and nuclear reactor power sources for a variety of SDI applications involving nonnuclear weapons and support systems.

Question: If nuclear systems were deployed, would you envision both ground-based and space-based systems? Are you concerned about moving toward nuclear systems in space? (New Space race/safety-environment)

Answer: If the United States were to deploy a strategic defense system which included nuclear directed energy weapons--and this would be a national decision which would have to be made by the President in concert with the Congress--we expect that such weapons would most likely be deployed in a ground-based "pop-up" launch mode. As part of our research program aimed at providing Soviet threat definition as soon as possible, however, we are examining the feasibility of a full spectrum of Soviet nuclear directed energy weapon deployment schemes (architectures) and the impacts such deployments could have on U.S. strategic defenses.

Question: What was the level of funding for SDI which was initially requested by the Department from OMB?

Answer: The Nuclear Directed Energy Weapons FY 1987 estimate was adjusted by $35 million from $571 million to $536 million. Part of the adjustment involved $15 million for the Strategic Defenses Facility. Congress requested that the Department of Defense and the Department of Energy jointly fund this facility, therefore, $15 million of the original $30 million request was transferred to the Department of Defense. The remaining adjustment of $20 million is associated with the follow-on funding of reimbursable work conducted for the Department of Defense in FY 1986 that was initially considered Department of Energy responsibility.

Question: What is the total amount of reimbursable SDI work for DOD which is proposed for FY 1987?

Answer: The total FY 1987 reimbursable funding for the DOE National Laboratories is anticipated to be about the FY 1986 level of effort, at about $242 million. We are unable to predict the precise level at this time because these are major programs that have the potential for changing the level.

Question: Please provide the Committee with a detailed breakdown of the request with FY 1985, FY 1986 and FY 1987 levels.

Answer: The detailed strategic defense initiative estimates are as shown in a table I would like to insert for the record.

(The information follows:)

Strategic Defense Initiative Estimates
(Dollars in Thousands)

	FY 1985	FY 1986	FY 1987
Assistant Secretary for Defense Programs			
Atomic Energy Defense Activities Appropriation			
Nuclear Directed Energy Weapons			
Research, Development, and Testing	$215,000	$267,900	$465,000
Capital Equipment	0	0	56,000
Strategic Defenses Facility	0	2,000	15,000
Total	$215,000	$269,900	$536,000
Assistant Secretary for Nuclear Energy			
Energy Supply Research and Development Appropriation			
Space and Defense Energy Systems			
SP-100 Space Reactor Technology	$ 8,800	$ 14,100	$ 25,000
SP-100 Construction	0	1,900	5,000
Dynamic Isotope Power System	0	0	13,000
Multimegawatt Power System	0	1,800	23,700*
Total	$ 8,800	$ 17,800	$ 66,700
Grand Total	$223,800	$287,700	$602,700

---

*Excludes $3 million for Multimegawatt Terrestial Power Plant.

Nuclear Energy

Question: Mr. Secretary, on page 13, your statement indicates the budget proposes a fundamental shift in funding nuclear energy R&D activities. Your FY 1987 budget proposes some large shifts, particularly in the advanced reactor research, away from civilian reactor research and into military research. Will the current efforts in civilian R&D be reduced and finally eliminated.

Answer: Our civilian R&D activities are based on understandings that we have developed over the past several years related to market requirements for new electric generating capacity, vendor and laboratory assessments of the status of existing technology, and the feasibility of future technology advancement to meet market needs. The level of R&D recommended for FY 1987 is sufficient to address key technology and regulatory issues. It is our intent to continue R&D in support of addressing those issues, which must be resolved before economic advanced reactor concepts can be developed and commercialized by the private sector. It is not our intent to eliminate our civilian nuclear energy R&D efforts on advanced reactors.

Question: The American Nuclear Society has stated that "each SDI installation (ground-based) will require a secure power source and nuclear reactors will almost certainly provide the power. Deployment is now seen as "soon". . . the race is on to select a standard design . . . that will become an integral part of each SDI installation." In your view, is this an accurate assessment? How "soon" do you see deployment of these SDI installations?

Answer: Ground-based assets are an important part of the Strategic Defense Initiative (SDI) program; however, decisions on deployment have not been made. Power will certainly be an important consideration for any ground-based assets and the following statement by General Abrahamson in a letter to Lt. Gen Leo Marquez, USAF (DCS Logistics and Engineering), highlights the potential of nuclear systems:

> "As you may know, in addition to space power for spaceborne assets, the SDI may also have needs for secure power for its terrestrial modes.
>
> "The thrust of the current SDI power program is to identify and resolve the critical issues related to technical feasibility and affordability of space- based power systems. However, ground-based power such as can be provided by the Secure Military Powerplant system will require much greater attention as we move into a deployment mode. An operational Secure Military Powerplant would likely provide a significant benefit for deployment of ground-based SDI assets."

An operational Secure Military Powerplant (now known as the Multimegawatt Terrestrial Powerplant) can also provide the secure and reliable power which will be needed for the essential command, control, communications and intelligence subsystem of the SDI. These subsystems will need to operate reliably in hostile environments and be invulnerable to sabotage.

Funding for Magnetic Fusion

Question: In magnetic fusion research, there also seems to be additional activity in military applications. For years, there has been talk of the first fusion reactor being a breeder of nuclear material. I understand that you are now proposing to study the feasibility of using magnetic fusion for producing the special nuclear materials used for nuclear bombs and warheads. Would you comment on this new study?

Answer: I assume the study being referred to is the DOE-funded National Academy of Sciences (NAS) study of the Fusion Hybrid Reactor. The primary objective of this study, which will be completed by August 1986, is to address questions on the technical feasibility, potential, and utilization of the fusion hybrid reactor. Such a reactor is a fusion-driven device which, besides generating electricity, can produce fissile materials for fueling commercial nuclear reactors in a fuel cycle with potentially attractive cost, safety, and proliferation-resistant characteristics. The NAS study will also consider the possible use of magnetic fusion for production of materials used in military applications. Except for this element of the NAS study, there is no effort now planned to study magnetic fusion for producing the special nuclear materials contained in nuclear bombs and warheads.

Question: Do you see this military application as a nearer-term use of magnetic fusion than its use for generating electricity?

Answer: While it has not been shown conclusively, the plasma physics and reactor technology requirements of a fusion device designed to produce nuclear materials may not be as demanding as those for a fusion device designed to generate electricity. Therefore, it is technically possible that the military application of fusion could be achieved on a shorter time-scale than the commercial application of fusion for electricity generation. However, magnetic fusion research will continue its application focus on electricity generation.

Question: How much do you propose to spend in FY86 and FY87 for this effort?

Answer: With the exception of the funding needed to support the NAS study, no funds are being provided in FY86 for studies directly related to nuclear material production with magnetic fusion. Funding for such work in FY87 and beyond will be considered following DOE's review of recommendations from the NAS study.

Nuclear Waste

Funding for the high-level commercial waste program would jump 54 percent, from $499 million in 86 to $769 million in FY 87. This program is paid for from a fee levied against nuclear utilities.

Question: Why is this large increase necessary in FY 87? (Please provide a breakdown of funding at the 3 proposed waste repository sites in FY 86 and FY 87 with amounts to specific contractors).

Answer: The reasons for increased FY 1987 funding relative to FY 1986 listed by sub-program are:

For the first repository, the increase is mainly required for extensive site characterization, initiation of exploratory shaft construction and intensive engineering tests and analyses to support waste package and repository designs.

For the second repository, the increase will provide for: preparation for area-phase field studies in the crystalline rock repository project; expanded cooperative efforts with the Atomic Energy of Canada Limited/Underground Research laboratory and the Swedish/Stripa projects; grants to affected States and Indian Tribes; and engineering activities related to waste package and repository design.

For the MRS, the increase is requested for implementation of activities in each of the following categories: design, regulatory and institutional, systems support and program management.

For transportation the increase will provide for: execution of transportation cask development contracts which will also require increased support of outreach and institutional activities; implementation of the Transportation Institutional Plan issued in FY 1986; increased efforts in economic and environmental analyses required to provide route specific information for the environmental impact statement; and continued development of technology and data systems to aid in issue resolution for institutional obstacles that may impede transportation system development or generate increased costs.

For systems integration the increase will provide for: development and conduct of prototypical demonstrations for dry rod consolidation techniques aimed at developing efficient and cost-effective waste handling and packaging equipment; and accelerated waste management systems integration activities supportive of issue resolution of interface and logistic problems between the waste generators, handling and packaging operations and repository operations.

For technical support the additional funds are required for increased level of effort on technical support integration and coordination of the Civilian Radioactive Waste Management Program, defense waste studies including waste package design and development testing, and to initiate technical services to support preparation of the Environmental Impact Statement for the first repository and environmental analysis. Other increases include information activities, technical support for policy issues and evaluation of waste package designs, financial assistance to national organizations, siting analysis/assessment and development and analysis of performance assessment models used by the repository projects.

Program management funding levels remained virtually unchanged.

A breakdown of funding at the three proposed sites is attached.

DEPARTMENT OF ENERGY
FY 1987 CONGRESSIONAL BUDGET
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
OBLIGATIONS BY CONTRACTOR AND LOCATION
NUCLEAR WASTE FUND
(Dollars in Thousands)

DESCRIPTION	FY 1986 FINAL APPROP.	FY 1987 DEPT REQUEST
FIRST REPOSITORY-OPERATING		
BASALT-RICHLAND OPS OFFICE		
ROCKWELL HANFORD, RICHLAND, WA - 04	85,265	111,100
MORRISON-KNUDSEN, RICHLAND, WA - 04	13,000	34,100
KAISER ENGINEERS/RPB, OAKLAND, CA - 09	8,000	4,600
WESTINGHOUSE HANFORD, RICHLAND, WA - 04	4,500	5,200
PACIFIC NW LAB (BATTELLE), RICHLAND, WA - 04	5,500	5,100
ALL OTHER CONTRACTORS: GRANTS		
OLYMPIA, WA - 03	2,300	
RICHLAND, WA - 04	4,400	
PENDLETON, OR - 02	1,000	
LEWISTON, ID - 01	1,000	
TOTAL BASALT OPERATING	124,965	160,100
SALT-COLUMBUS PROJECT OFFICE		
LAWRENCE LIVERMORE NATL. LAB., LIVERMORE, CA - 09	175	521
BATTELLE MEMORIAL, COLUMBUS, OH - 12	88,654	119,502
CHICAGO-SRPO, COLUMBUS, OH - 12	21,562	4,483
FLUOR, IRVING CALIFORNIA 99	18,433	21,245
PARSONS-REDPATH, COLUMBUS, OH - 12	7,310	22,285
PACIFIC NW LAB (BATTELLE), RICHLAND, WA - 04	2,000	4,932
LAWRENCE BERKELEY, BERKELEY, CA - 02	125	325
LOS ALAMOS NATL. LAB., LOS ALAMOS, NM - 03	0	94
ARGONNE NATL. LAB., ARGONNE, IL - 13	1,220	1,265
OAK RIDGE NATL. LAB, OAK RIDGE, TN - 03	125	104
BROOKHAVEN NATL. LAB., UPTON, NY - 01	110	0
ID-GJ, GRAND JUNCTION, CO - 03	670	3,511
OAK RIDGE OPS., OAK RIDGE,TN - 03	170	261
ALL OTHER CONTRACTORS: GRANTS		
AUSTIN, TX - 10	4,500	
TOTAL SALT OPERATING	145,054	178,528

DEPARTMENT OF ENERGY
FY 1987 CONGRESSIONAL BUDGET
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
OBLIGATIONS BY CONTRACTOR AND LOCATION
NUCLEAR WASTE FUND
(Dollars in Thousands)

DESCRIPTION	FY 1986 FINAL APPROP.	FY 1987 DEPT REQUEST
TUFF-NEVADA OPS OFFICE		
SANDIA NATL. LAB., ALBUQUERQUE, NM - 01	25,300	31,455
USGS, LAS VEGAS, NV - 02	16,645	29,492
SCIENCE APPL., LAS VEGAS, NV - 02	14,891	17,484
REECO-REYNOLDS, LAS VEGAS, NV - 02	11,461	38,210
LOS ALAMOS NATL. LAB., LOS ALAMOS, NM - 03	12,900	15,566
LAWRENCE LIVERMORE NATL. LAB., LIVERMORE, CA - 09	12,600	15,050
NEVADA OPS., LAS VEGAS, NV - 02	1,570	12,051
LAWRENCE BERKELEY, BERKELEY, CA - 02	400	400
HOLMES & NARVER, LAS VEGAS, NV - 02	1,227	1,093
FENIX & SCISSON, LAS VEGAS, NV - 02	3,206	5,799
ALL OTHER CONTRACTORS: GRANTS LAS VEGAS, NV-2	4,600	
TOTAL TUFF OPERATING	104,800	166,600
TOTAL GRANTS FOR 1987		18,772
TOTAL OPERATING-FIRST REPOSITORY	374,819	524,000
FIRST REPOSITORY-CAPITAL		
BASALT-RICHLAND OPS OFFICE		
ROCKWELL HANFORD, RICHLAND, WA - 04	2,311	3,795
PNL (BATTELLE), RICHLAND, WA - 04	15	30
WESTINGHOUSE HANFORD, RICHLAND, WA - 04	235	175
MORRISON-KNUDSEN, RICHLAND, WA - 04	24	4,800
TOTAL BASALT CAPITAL	2,585	8,800
SALT-COLUMBUS PROJECT OFFICE		
PARSONS-REDPATH, COLUMBUS, OH - 12	0	2,660
BMI, COLUMBUS OH - 12	3,000	140
TOTAL SALT CAPITAL	3,000	2,800
TUFF-NEVADA OPS OFFICE		
LAWRENCE LIVERMORE NATL. LAB., LIVERMORE, CA - 09	0	330
SANDIA, ALBUQUERQUE, NM - 01	0	250
LANL, LOS ALAMOS, NM - 03	0	2,044
ALL, REECO, USGS, SAI, LAS VEGAS NV - 02	4,000	3,576
TOTAL TUFF CAPITAL	4,000	6,200
TOTAL CAPITAL-FIRST REPOSITORY	9,585	17,800
TOTAL FIRST REPOSITORY	384,404	541,800

Question: What is the total estimated cost of the program?

Answer: The current total estimated cost of the program without the MRS ranges from $23.6 billion to $32.3 depending on which media pair is finally selected for the first and second repositories.

Question: Do you anticipate the need in the future for an increase in the fee?

Answer: The Nuclear Waste Policy Act requires that an analysis of the adequacy of 1 mill/kWh fee be performed annually and that a report of the results of that analysis be submitted to the Congress. The report, "Nuclear Waste Fund Fee Adequacy: An Assessment", has been completed and is to be submitted to the Congress in March 1986. It indicates that no adjustment to the fee is expected to be required this year. Until we have selected the repository sites and other facets of the program are clarified, including the fee for defense costs, it is premature to conclude that any adjustment to the fee will be required.

Nuclear Waste

Question: What is the status of the MRS facility? (Monitored Retrievable Storage)

Answer: The Department has included funding for the activities critical to the timely deployment of a Monitored Retrievable Storage (MRS) facility in the fiscal 1987 budget provided to the Congress on February 5, 1986. On February 5, the U.S. District Court for the Middle District of Tennessee issued a declaratory judgment that the NWPA required the Department to consult and cooperate with the state during siting studies conducted prior to Congressional authorization of construction of an MRS. This judgment was followed on February 7, by an injunction from the same court which permanently enjoins the Department "from making any proposal to Congress or filing any documents with Congress which rely on siting studies..." already completed. The specific proposal for an MRS facility mandated in Section 141 (b) of the Nuclear Waste Policy Act was scheduled to be provided to the Congress in early February after the Department had received the comments from the Nuclear Regulatory Commission, the Environmental Protection Agency and the State of Tennessee to send to the Congress with the proposal. Although review copies were provided to interested parties in December, and the formal proposal, its required supporting documentation, and the comments from the State and other federal agencies are ready for submission to the Congress, the District Court injunction prevents the Department from submitting the proposal.

Nuclear Waste

Question: When will DOE send to Congress the proposal for an MRS facility to be sited, I believe, at the former Clinch River reactor site in Tennessee?

Answer: At present, submission of the formal MRS proposal to Congress depends upon the outcome of current judicial proceedings. The Department has appealed the decision issued by the U.S. District Court for the Middle District of Tennessee to the U.S. Court of Appeals for the Sixth Circuit. Submittal of the formal MRS proposal to the Congress will depend upon the schedule of the Circuit Court to expeditiously hear the case, as well as what the content and effect the ruling will have on the proposal. Submittal of all briefs to the Court is scheduled to be completed by May 2, 1986.

Funding Deferral for Mod-5B Wind Turbine

Question: The budget requests for the wind energy program for fiscal year 1987 do not contain any funds for the Mod-5B multi-megawatt wind turbine development program. In addition, the Administration has announced deferral of the majority of the $12 million appropriated by Congress for the Mod-5B program in fiscal year 1986.

More than $60 million in federal funds have already been spent on the Mod-5B program. We are near completion of this development program. The Mod-5B is the "centerpiece" of our lengthy efforts to see that a large wind machine is developed. Equipment has been ordered, and the necessary hardware is now warehoused on the West Coast, ready for transportation to and assembly in Hawaii. The site for the windmill has been prepared, and all that remains is for the hardware to be assembled and the windmill tested. The private contractor and the government have both indicated that no technical problems are expected. A private buyer for the windmill has entered into a contract with the government. In view of the advanced stage of this project and the significant amount of federal resources already committed to it, why has your Department deferred fiscal 1986 funding and failed to request additional funding to complete the program in fiscal 1987?

Answer: Both the government and industry have a substantial investment in the Mod-5B program. Much of the value from this program will be derived from the engineering studies and detailed design of the machine. This information be will published and available to the entire wind industry. In addition we have already learned much from the extended testing of the Boeing-designed Mod-2 turbines. We believe that more fundamental research on aerodynamics and structural modeling, as supported in the FY 1987 Budget Request, is of higher priority and will benefit a broader segment of industry than would proceeding with installation and testing of a single piece of hardware. This is reinforced by generally declining interest in the commercialization of very large wind turbines at this time.

Office of the Secretary

Question: Based on the 31 FTE's in FY 86 and FY 87, how many full time equivalents were consumed or on-board in FY 86 and proposed for FY 87?

Answer: There are 32 employees on-board at the present time in the Office of the Secretary and in FY 87 this Office proposes 31 FTEs.

Question: Your FY 87 budget proposes another $27,000 or a 14% increase over FY 86 for travel. What specific travel plans are proposed to justify this increase? Provide the Committee with a more detailed breakdown of travel expenses for FY 86 and FY 87.

Answer: The total obligational authority for Office of the Secretary travel for FY 86 is $305,000. This reflects reallotment of FY 85 unobligated balances of $112,000. The FY 87 request of $220,000 is therefore a decrease from FY 86 planned obligations of $305,000. A further breakdown of travel expenses for FY 86 and FY 87 is as follows:

International Travel to attend international events and meet with various Ministers of Energy and Foreign Affairs, i.e., Vienna - IAEA, Paris - IEA Ministerial, London - Energy Issues:

FY 86	FY 87
$120,000	$137,000

Domestic Travel in support of Departmental Program and Management initiatives:

	FY 86	FY 87
	$185,000	$83,000
Total	$305,000	$220,000

Question: Explain the need for $2,000 for special training programs for staff?

Answer: The training funds requested in the FY 87 budget are for the purpose of providing appropriate management training for the staff of the Office of the Secretary, thus precluding the use of training funds from another DOE organization.

Management and Administration

Question: Please explain the need for $8.1 million increase requested in FY 87. Indicate the total requests for M&A for FY 85, 86 and 87 including FTE's requested and consumed.

Answer: The $8.1 million increase requested in FY 1987 for Management and Administration reflects additional funding needs in salaries and expenses, travel and contractual services and supplies.

An increase of $3.3M in Salaries and Expenses is requested to fully fund 1,117 FTEs, an increase in average salaries, within-grade increases, promotions, a new legal requirement regarding Relocation Income Tax Allowance, an increase in Workmen's Compensation payments and increased costs of SES Rank and Performance Awards. The $.5M increase in Travel will provide additional support for the review and assessment of field programs and policy implementation, and increased support for the Departmental Training Program for advanced managment and project management training programs. The $6.5M increase in Contractual Services and Supplies is attributed to fixed costs for Standard Level User Charges wherein GSA sets the rates. These increases are offset by a $2.2M decrease in capital equipment.

The total requests for Management and Administration for FY 1985, FY 1986 and FY 1987 including FTEs requested and consumed is as follows:

	FY 1985 Congressional Request	FY 1986 Congressional Request	FY 1987 Congressional Request
Program Request	$134,194	$141,608	$146,147
Less use of prior year deobligations	$0	$0	($6,000)
Budget Authority	$134,194	$141,608	$140,147
FTEs Requested	1120 1/	1117 2/	1117
FTEs Consumed	1088	3/	N/A

1/ FY 85 request in the FY 86 Congressional Budget Request.
2/ FY 86 request in the FY 87 Congressional Budget Request.
3/ 423 FTEs consumed to date for FY 1986. Projected FY 1986 usage is 1,110 FTEs.

OPERATIONS OFFICES

Question: Please explain the need for an increase for the operations offices. Provide a breakdown for each activity at each office in FY 85, 86 and FY 87.

Answer: The FY 1986 level of funding reflects new budget authority required at the Operations Offices adjusted for Gramm-Rudman-Hollings. In addition, prior year balances are needed to sustain a current level of operations in FY 1986. Comparing FY 1986 total actual requirements with the FY 1987 request there is an actual decline in projected requirements. In addition, the FY 1987 budget absorbs increases for fixed costs such as rents, utilities and telecommunications. This is accomplished through greater efficiences and a small reduction of FTE's. The table that provides a budget authority breakdown for each activity by office for FY 1985, 1986 and FY 1987 will be inserted for the record. (The information follows:)

BACKUP3 DOE OPERATIONS OFFICES 20-Mar-86

(BUDGET AUTHORITY IN THOUSANDS)

OPERATIONS OFFICES	FY 1985	FY 1986	FY 1987
CHICAGO OPERATIONS OFFICE:			
SALARIES AND BENEFITS................	$13,617	$13,686	$14,980
TRAVEL...............................	$500	$326	$421
SUPPORT SERVICES.....................	$5,694	$5,583	$5,800
CAPITAL EQUIPMENT....................	$277	$267	$225
TOTAL, CHICAGO OPERATIONS OFFICE........	$20,088	$19,862	$21,426
IDAHO OPERATIONS OFFICE:			
SALARIES AND BENEFITS................	$9,252	$9,123	$9,400
TRAVEL...............................	$400	$261	$425
SUPPORT SERVICES.....................	$2,854	$3,562	$3,750
CAPITAL EQUIPMENT....................	$300	$289	$300
TOTAL, IDAHO OPERATIONS OFFICE..........	$12,806	$13,235	$13,875
OAK RIDGE OPERATIONS OFFICE:			
SALARIES AND BENEFITS................	$19,579	$19,832	$20,500
TRAVEL...............................	$400	$261	$337
SUPPORT SERVICES.....................	$5,554	$5,776	$6,288
CAPITAL EQUIPMENT....................	$246	$193	$200
TOTAL, OAK RIDGE OPERATIONS OFFICE......	$25,779	$26,062	$27,325
RICHLAND OPERATIONS OFFICE:			
SALARIES AND BENEFITS................	$10,440	$10,604	$11,021
TRAVEL...............................	$400	$261	$337
SUPPORT SERVICES.....................	$3,656	$3,081	$3,466
CAPITAL EQUIPMENT....................	$300	$96	$100
TOTAL, RICHLAND OPERATIONS OFFICE.......	$14,796	$14,042	$14,924
SAN FRANCISCO OPERATIONS OFFICE:			
SALARIES AND BENEFITS................	$10,767	$10,455	$10,966
TRAVEL...............................	$450	$294	$379
SUPPORT SERVICES.....................	$4,950	$4,755	$5,177
CAPITAL EQUIPMENT....................	$150	$143	$150
TOTAL, SAN FRANCISCO OPERATIONS OFFICE..	$16,317	$15,647	$16,672
TOTAL, OPERATIONS OFFICES..............	$89,786	$88,848	$94,222

Minority Honors Training Program

Question: Describe the success of the Minority Honors Training Program including industry participation and job placement of graduates.

Answer: Since 1982, the Minority Honors Training Program has provided over 2,000 scholarships to financially needy minority honor students at nine colleges across the country. The program has included Luna Vocational Technical Institute and Northern New Mexico Community College for Hispanic Americans; Bronx Community College in New York for predominately Puerto Rican Americans and Hispanic Americans; Greenville Technical College in South Carolina and Coahoma Jr. College in Mississippi for predominately Black Americans; Laney College in California for predominately Asian Americans and Black Americans; Hawaii Community College in Hawaii for Asian Americans; Oklahoma State Tech in Oklahoma for predominately Native American Indians; and Anchorage Community College in Alaska for Alaskan Native Americans. Of the total number of graduates from this program nationwide, 86 percent have been placed into jobs, as of December 1985.

Since 1983, the Department of Energy has served as the catalyst to initiate and develop industry participation in working with the two Department of Energy funded northern New Mexico colleges. These "match-making" efforts between the New Mexico energy-related industrials and the two colleges (1) provide better job opportunities to the financially needy honor students; (2) transfer the energy-related technologies to the northern part of New Mexico, and (3) better meet specific needs of the industrials by having them work directly with the colleges and the students. The Department has only undertaken these efforts in New Mexico. Fourteen major New Mexico industrials have, are presently, and will provide specialized training, cooperative training, summer employment, full-time employment after graduation, equipment and cash donations, to the two New Mexico colleges. These industrials include:

1. Computer Science Corporation
2. BDM Corporation
3. EG&G Kirtland Operations Office
4. EG&G Los Alamos Operations Office
5. Digital Equipment Corporation
6. Intel Corporation
7. GTE Communications System Corporation
8. General Electric Company
9. Mortorola, Inc.

10. Sperry Corporation
11. Sparton Technology, Inc.
12. Missouri Research Labs
13. AM Building Systems
14. Montana de Fibra, Inc.

Question: Why do you propose to cut substantially the Honors Training Program?

Answer: Because of competing funding resources, a program decision was made to transfer funding from the Minority Honors Training Program (two-year colleges) to the Minority Educational Institution Assistance Program (four-year colleges and universities). This decision was made with the intent of spreading limited funding resources from two-year vocational training programs to four-year minority educational institutions for infrastructure development, private sector interrelationships and energy-related science and technology research centers starting in 1986.

Question: List the nine colleges which participate in the Honors Training Program with levels of funding in FY 86 and FY 87.

Answer:	FY 1986 Adjusted Appropriation	FY 1987
Luna Vocational Technical Institute	$ 70,000	$ 66,000
Northern New Mexico Community College	40,000	-
Coahoma Jr. College	30,000	-
Anchorage Community College	45,000	-
Hawaii Community College	20,000	-
Laney College	45,000	-
Bronx Community College	50,000	-
Greenville Technical College	57,000	-
Oklahoma State Tech	45,000	-
		55,000 1/
	$402,000	$121,000

Question: Why are you proposing to eliminate the Minority Educational Institution Assistance Program? Please provide a breakdown of funding by activity and institution for FY 86.

Answer: The Minority Educational Institution Assistance Program will not be eliminated in fiscal year 1987. Due to the lengthy start-up process, $393,000 of the $785,000 appropriated in fiscal year 1986 will be deferred. In 1987 these funds will be used to continue the program. Two other activities of the program, the Minority Institution Research Travel and Direct Technical Assistance will be supported for the remainder of fiscal year 1986.

1/ College to be determined at end of FY 1986.

Fiscal year 1986 awards for this program to date by activity and institution are as follows:

Minority Institution Research Travel (MIRT) - Ten (10) institutions have received approval for eighteen (18) trips in support of research activities for faculty and students. $13,450 has been obligated with an average cost of $700-800 dollars per trip. Institutions represented are:

Institutions	Travel Approved
Selma College	5
Miles College	3
Southern U. System	3
University of Arkansas (Pine Bluff)	1
Howard University	1
Tennessee State	1
Alabama A&M	1
Mississippi Valley State	1
Tuskegee University	2

Technical Assistance

Institution	Amount	Project
Howard University	$20,000	Continued support of the Black College Satellite Network to enhance Collaborative R&D
Atlanta University	$30,000	Implementation of a Thematic Workshop to support the Collaborative R&D Cluster Model

Infrastructure Support and Private Sector Interrelationships - These two activities will be awarded as the result of a competitive procurement. The awards are scheduled for the late summer and will cover two fiscal years. The budget is sufficient to fund two awards in each activity.

Question: Provide for the record, a list of specific studies performed under contract in FY 86 and FY 87 with total estimated cost of each.

Answer: The Office of Policy, Planning and Analysis has approved the following specific studies for the estimated costs indicated:

	Type of Study	Estimated Cost (in thousands)
o	Refinements, extensions and updates to energy projection models	$300
o	Analysis of world refining economics	95
o	World Oil Demand Model	120
o	Refinements and improvements to the Four Region World Oil and Oil Trade Models	60
o	Natural gas market computer simulations	100
o	Natural gas modeling for analysis of regulations	102
o	Improvements in the Two-Market Gas Model	30
o	Refinements and improvements to the Gas Trade Model	30
o	Analysis of natural gas spot markets	6
o	Natural gas policy future	25
o	Keystone energy futures project	25
o	Economic analysis of importing electricity from Canada	80
o	Analysis of energy effects of tax reform proposals	50
o	Analysis of the Conservation Automobile Fuel Efficiency standards (CAFE)	85
o	Estimating automobile fuel economy from diary data	45
o	Energy implications of changes in the Personal Consumption Expenditure component of the GNP	55

	Type of Study (continued)	Estimated Cost (in thousands)
o	Analysis of oil use trends in developing countries	120
o	Analysis of energy use trends by fuel types and service sector	90
o	Analysis of the methanol fuel market	55
o	Analysis of the market for auto/appliance efficiency	18
o	Analysis of international nuclear markets	37
o	Analysis of energy/GNP interaction	60
o	Cross impact matrix application to energy price	75
o	Impact of stock turnover on efficiency trends	40
o	Impact of falling oil prices	100
o	Commercial and residential building demand modeling	150
	Total	$1,953

At this point in the project development process, the Office of Policy, Planning and Analysis does not have a list of approved studies to be performed under contract in FY 87. Its FY 87 request for policy and system studies is $4,500,000. This request will continue to provide a high level of quality for both short- and long-term studies and analyses. Results from these studies are important for the continued development and refinement of energy policy in a consistent and effective manner. In addition to short- and long-term studies, efforts will be directed toward continuous monitoring, analyzing, and forecasting of the Nation's energy production, supply, and markets.

Congressional, Intergovernmental and Public Affairs

Question: Please provide a breakdown of program direction for the separate offices including Congressional Affairs with levels and FTE's (both requested and consumed) for FY 85, 86 and 87

Answer: Staffing and funding levels for these offices are provided in the following table:

(Dollars in Thousands)

	FY 1985				FY 1986		FY 1987	
	Request		Consumed		Request		Request	
	FTE	Funds	FTE	Funds	FTE	Funds	FTE	Funds
Assistant Secretary & Administration	9	$ 345	11.0	$ 568	9	$ 434	9	$ 451
Congressional	35	1339	34.5	1781	35	1686	35	1754
Communications	39	1493	41.8	2158	39	1879	39	1954
Public Liaison	5	191	3.7	191	5	241	5	250
Total	88	$3368	91.0	$4698	88	$4240	88	$4409

Question: Provide a listing of analyses and studies which are contracted for in the Division of Competition for FY 86 and FY 87.

Answer: Presently, the Division of Competition has no analyses or studies under contract. The funds requested for FY 86 and FY 87 are or will be available if, and when, contractor assistance is required. There are several efforts underway in the Division that may require contractor assistance including oil pipeline deregulation, oil pipeline financial characteristics, and investment strategies of restructured petroleum companies.

Question: Please provide the levels of funding in FY 86 and 87 for the new Office of Public Liaison, CERT (Indian affairs) and any other activities which were funded through the Office of the Secretary.

Answer: Program direction funding for the newly established Office of Public Liaison for FY 86 is $241,000 and FY 87 is $250,000. No program support funding is required for this Office since all activities and functions will be carried out by our staff. I feel that we can continue to manage this program effectively without contractor assistance, as we have in the past. The public liaison function was the only program transferred from the Office of the Secretary. Contractual funding for the Council of Energy Resource Tribes (CERT) is $289,000 for FY 86 and $200,000 for FY 87.

International Affairs

Question: Please explain in detail the need for an increase in policy studies. List all studies contracted for in FY 86 and FY 87 with funding levels.

Answer: The funding for International Policy Studies assists the Office of International Affairs in carrying out its responsibilities for formulating international energy policy, assessing and analyzing current global energy trends and developments, and advising the Secretary on international energy issues. These studies, models, data acquisitions, etc., provide a basis for examining and assessing developments in the world energy situation which may affect both domestic energy objectives and cooperative energy efforts with other nations. These policy studies provide independent views on complex and continually changing international energy issues. The Office of International Affairs requires these independent, objective views to broaden its analytical base for policy formulation.

The FY 1987 Department Request for International Policy Studies is $1,700,000. This amount exceeds by $737,000 the FY 1986 adjusted appropriation. The need for increased support is primarily related to the area of international R&D collaboration. These policy studies will provide the basis for implementing the Secretary's goal of increasing international involvement as a means of maintaining scientific momentum consistent with increasingly stringent budget requirements. Through persuasive international R&D policy that convinces our allies of the merits of increased collaboration, R&D program cost savings of more than twenty million dollars per year are clearly feasible.

The IA studies provide the intellectual capital to formulate R&D collaboration policies consistent with overall foreign policy, to improve our ability to understand foreign country energy technology programs within the context of their overall energy policy. Those studies also help to develop strategies that will ensure that our international collaboration activities will provide significant benefits to this country and assist us in negotiating positions for bargaining with specific countries, including possible multiple technology arrangements.

Our policy studies money also provide the funding to develop and operate essential management information systems on our international agreements and their related commitments; on the status of agreements in negotiation and the key negotiating points; on administrative arrangements and impediments so that prompt, effective action may be taken to ensure efficient collaboration; on total foreign travel to improve coordination and reduce excess travel; and on foreign visitors and assignees to U.S. facilities to improve control of technology transfer.

Studies under contract or in process to obtain a contractor for FY 1986 are provided below. No studies are under contract for FY 1987.

List of Approved Studies
(Dollars in Thousands)
As of 03/01/86

Studies	Cost
Development of a Pacific Basin energy strategy	150
U.S. energy policy options for developing countries	50
Transcription services for IEA oil industry meetings (Required by 10 CFR 209)	80
Coal import/export data services	20
Utilization of natural gas resources in developing countries	15
Support services for DOE obligations in the IAEA	100
System development for recruitment of U.S. personnel for IAEA critical positions	45
Support to IAEA electric system training program in China	30
Development of management information and approval systems for foreign travel and foreign visits and assignments	180
Development of management information system for international R&D agreements and commitments	60
Support services for coordination of international nuclear waste management activities (with NE, RW, and DP)	25
Alternate international energy R&D collaboration strategies and the associated benefits and costs to DOE	100
Analysis of international electricity trade and the energy security implications	65
Evaluation of priorities and benefits of U.S. technical assistance programs for the IAEA	43
TOTAL .	963

Question: Provide a complete list of all now proposed study areas and the amount allocated in FY 87 for each.

Answer: The following list identifies new proposed study areas and the amounts proposed for FY 87.

New Study Areas
(Dollars in Thousands)

Studies	Cost
The development of foreign country technology profiles on key programs, individuals, organizations, and foreign policy to assist in the development of negotiating strategies;	200
Analysis of policy factors in R&D Cooperation that will permit adequate input of past experience in the development of new cooperative arrangements.	60
The establishment of a DOE centralized document system to provide improved access to critical information to respond to the needs of the Secretary, OMB and the Congress.	25
Analysis of impact of Energy Technology on Energy Security to support IA participation in the formulation of an R&D Policy for IEA.	40
Analyses of strategies for enhanced private sector involvement in international cooperation and the trade impacts of international energy R&D cooperation.	90
Implications of investments by the oil producing countries in downstream oil refinery and petrochemical facilities on oil trading patterns, particularly in Europe.	80
The investment climate for hydrocarbon exploration in LDC's and the impact on the extent of R&D activity.	40
Changes in the structure of the world oil market and their impact on oil security.	120
Identify remedies to factors that restrict penetration of coal (and level of U.S. coal exports) in OECD coal markets and perform cost/benefit analysis of measures to reduce/eliminate restrictions.	50

QUESTIONS SUBMITTED BY SENATOR MCCLURE

Nuclear Energy

Question: The 1987 Department of Energy budget submittal cites the use of ten-megawatt electric reactors as one specific area in which the nuclear technology has military and civilian applications. During the 1986 budget cycle, DOE did not request funding for this project, the Secure Military Power Project, even though it was needed to match Department of Defense funds agreed to in a memorandum of understanding between the two agencies. This committee provided the funding which required some reprogramming within the department. I am disturbed at the apparent lack of commitment the DOE has shown for this project. What is the status of the SMPP? Has this reprogramming taken place?

Answer: DOE believes that it has demonstrated a significant commitment to the SMP project. For example, the only Government funds spent on the project to date are $2 million in DOE funds reprogrammed in FY 1984 after consultation with the Air Force. These funds permitted conceptual design studies to be conducted.

The FY 1986 Conference Report provided that "...additional funds may be available for Secure Military Plant contingent upon commitment of the Air Force to offset full research and development cost should a decision be made to precure SMPP units."

The Air Force decision to proceed with plant design was made in November 1985 and Air Force funds were made available to DOE on February 21, 1986. As a result, DOE is presently considering a reprogramming for FY 1986. Upon receipt of the Air Force funds, a Request for Proposals (RFP) was reactivated by the Department's Idaho Operations Office (who will manage the procurement) and submitted to DOE Headquarters and the Air Force for review and comment. The comments generated by these reviews are being accommodated. We expect to issue this RFP by the end of March 1986.

Question: The Department's 1987 budget submittal discusses the "significant shift in nuclear energy research and development program emphasis and priorities towards supporting national security requirements, including the Strategic Defense Initiative." This shift reduces advanced reactor R&D funding by $79 million, and increases the space and defense power systems to $72 million.

Has a separate office been established within the department to direct this increased effort or does the department intend to establish such an office?

With the growing number of military space application projects currently planned by the department, is an effort being made to center project management offices at specific national laboratories, such as the Nuclear Regulatory Commission is doing in its newly developed "technical integration centers"?

Answer: In July 1985, the Department's Nuclear Energy activities were reorganized. As part of this reorganization, an Office of Defense Energy Projects and Special Applications was formally established under the Deputy Assistant Secretary for Reactor Systems, Development, and Technology. This office is composed of two divisions--the Division of Defense Energy Projects, whose prime focus is on space and terrestrial reactor systems for defense, and the Division of Special Applications, with a similar focus on isotopic systems. This office has served to provide the required focus to the Department's defense nuclear energy activities as well as to centralize technical and management expertise on various joint projects where multi-agency interaction is essential.

The Department is indeed moving to center project management activities at its field offices and laboratories. For example, a project office has been established for the SP-100 program which jointly involves NASA's Jet Propulsion Laboratory and DOE's Los Alamos National Laboratory. A project office has also been established at the Idaho Operations Office to manage the Multimegawatt Terrestrial Powerplant (MTP) and efforts are underway to establish a field Project Integration Office for the multimegawatt space power program.

Question: It is envisioned a number of existing resources developed as part of the nuclear energy program at DOE will be used to support the SDI program. What steps is the department taking to define SDI requirements to guide application of DOE resources?

Answer: The basic approach used by the Department to define Strategic Defense Initiative (SDI) and Air Force requirements is to work closely with the ultimate mission users of both land-based and space-based power sources.

For example, within the SP-100 program, efforts are focused on a 300 KWe electric propulsion orbital transfer reference mission. This reference mission was established by the SDI Office and defines the requirement for the reactor design and hardware to be built and tested.

For the multimegawatt program, SDI has defined three modes of power use--continuous, alert and burst--with specific durations and levels of power for each. Power producing concepts have been defined with the potential to meet these requirements. These requirements, in turn, identify the technology development programs required to support the various concepts. Typical technical areas are: Fuels, Materials, Heat Rejection and Transport, Thermal Hydraulics, Instrumentation and Control, Energy Conversion and Storage, and Safety. These development programs specify the DOE resources needed to meet the SDI needs.

In a related activity to guide application of DOE resources, the Department is currently correlating user needs and surveying available test facilities to ensure that the SDI program testing needs are being met in a cost effective manner and without duplication of effort.

Question: The shift from civilian to military nuclear R&D could have vitally important international ramifications that will directly affect our nation. Internationally, the use of nuclear energy is growing and further growth is inevitable. The U.S has so clearly shaped and led the world in the responsible use of nuclear energy, what will be the long term international impact of the U.S. opting out of civilian development and applying its resources to military requirements?

Answer: The United States is not opting out of civilian nuclear development. The Department has long provided R&D support to both defense and civilian areas and will continue to do so in the proposed programs. It is our intention to integrate and coordinate those efforts to the maximum extent so as to minimize the overall Federal cost. The priority of military programs has not changed; programs have expanded and moved ahead as planned while the overall funding stringencies have tightened. The U.S. still possesses the most broadly based and advanced liquid metal reactor technology, and continues to have an advanced nuclear research and development budget comparable to other countries in the free world.

Question: Will international research agreements continue under this new policy if other countries would have to agree essentially to be part of U.S. military research?

Answer: Research and development advanced civilian reactor concepts will be continued and will serve as the basis for international research agreements with other nations. While advanced civilian designs will be evaluated for applicability to certain defense missions, the application of civilian concepts to defense will remain separate and distinct from the civilian effort in international efforts and will not involve foreign participation. Hence, our approach should not present problems for continued foreign cooperation.

Question: Can the United States continue to encourage and support joint cooperation research between our country and other nations such as Japan, France, and Germany?

Answer: Yes. The proposed FY 1987 civilian program continues joint cooperative programs on research between our country and other nations. Although the majority of our current international effort is with the Japanese, we will continue efforts for greater involvement with Germany and France. Public domain information on our advanced Liquid Metal Reactor and High Temperature Gas Reactor concepts has been received with great interest in Japan and France and may well become the basis for the United States establishing future collaborative agreements.

Question: A number of countries are forging ahead in nuclear R&D, and these have challenged our lead in the nuclear energy market. Will not this shift further erode our Nation's marketing capability?

Answer: In FY 1987, our efforts within the civilian program regarding defense will be limited to determining the suitability of advanced civilian designs for defense applications. The Department's primary effort will remain focused on advanced civilian reactor concept development and supporting R&D with emphasis on competitive economics, passive safety, and improved licensability. To date, progress has been encouraging; costs appear to be competitive with LWR's and coal plants, innovative passive safety features have been designed and will be tested, NRC interactions have been positive, and plant availability estimates are high. Public domain information available on these advanced designs is creating a great deal of interest in Japan and France. We believe that these designs will provide the basis for the United States retaining its leadership role in the nuclear field.

QUESTIONS SUBMITTED BY SENATOR DECONCINI

Power Marketing Administrations

Mr. DeConcini: What indication do you have that there would be competent private firms ready and able to step in to perform this vital function?

Secretary Herrington: While no specific proposals have been submitted in response to defederalization, I am informed that the Department has received informal inquiries of interest from both the private and public utility sections.

Mr. DeConcini: Under the privatization proposal what would be the fate of the employees who now operate these Power Marketing Administrations?

Mr. Herrington: In developing plans for the sale of PMA's, one of our goals is to recognize and provide appropriate protection for federal employees effected by the defederalization effort. We intend to keep this goal in the forefront at all times.

Mr. DeConcini: Do you have any studies or other indicators to show that the long range effect would not be a mushrooming of the rate schedules?

Secretary Herrington: The Department is currently beginning its efforts to study PMA defederalization through the process I have mentioned. We have recently assigned staff to this effort. As the defederalization efforts proceed and issues related to sale are identified, objective studies may be undertaken to assist in the decision-making process. At present, we have not performed electric rate studies relating to defederalization effort.

Mr. DeConcini: Under your proposal what will happen to the rates charged to customers for power generated at Federal facilities?

Mr. Herrington: The price of each Power Marketing Administration and the terms for defederalization of each Power Marketing Administration have not yet been determined. The effect on rates charged to the customer cannot be determined until a specific proposal for sale of each Power Marketing Administration is available. One of the primary principles we will be guided by in pursuing defederalization of the Power Marketing Administrations is to recognize the benefits currently enjoyed by existing customers and other interests.

Mr. DeConcini: The Administration has stated that power marketing is "not a proper Federal function". Since marketing of federal power has been ocurring since the inception of large scale hydropower in this country and since Bonneville Power Administration will celebrate its 50th birthday this year, could you please explain to me how you came to this conclusion?

Mr. Herrington: Utilities are not normally a Federal responsibility, and we believe non-Federal owners can operate the Power Marketing Administrations as efficiently, or more efficiently, than the Federal government. The Administration believes the proper responsibilities of the Federal government are to provide for the common defense, conduct foreign policy, administer a system of justice, and provide other services that benefit the nation as a whole. We further believe we need to scale back the role of the Federal Government to those activities that are most appropriately Federal in character. Thus, we can best contribute to the general welfare by allowing regional activities of a commercial business nature to be run by people and institutions within those regions.

Mr. DeConcini: What specific evidence do you have, beyond speculation, that there would be an overall benefit to the American taxpayer from selling the Power Marketing Administrations?

Mr. Herrington: The reduction of the Federal deficit is a high national priority at the present time. The Power Marketing Administrations currently have an unpaid federal investment of 12.7 billion dollars. Although specific sale prices have not yet been determined, it is believed that the sale of the Power Marketing Administations may have a substantial impact on deficit reduction. The President's fiscal year 1987 budget assumes that over the five year period of FY 1987 through FY 1991 the repayment proposal would contribute an additional $741 million to reduction of the deficit. Over the same time period defederalization of the Power Marketing Administrations is projected to contribute $13,879 million toward deficit reduction. This would be partially offset by $1,888 million of future revenues foregone.

Also, we believe that non-Federal organizations will be able to operate the Power Marketing Administrations equally or more efficiently than they have been by the Federal Government, and that regional organizations will be better able to operate the Power facilities of the PMAs in the best interests of their areas.

Solar Power

Question: Your budget submittal proposes cutting funds for solar research and development by 50% in the name of deficit reduction, yet your overall request represents an increase! How do you justify such a dramatic cut in solar when you are not reducing your overall budget?

Answer: In each of the applied research and development areas, the need to accomplish reduced Federal outlays has prompted us to critically examine every funding proposal. No area of technology has escaped this review process. In the case of renewable energy, the proposed reductions in new budget authority reflect a variety of considerations including the successful completion of previous lines of research, a focussing of public investment in the more basic areas most appropriate to the Federal role in technology research, and tough business decisions among competing technical priorities. The Departmental request for renewable energy reflects a commitment to sustaining a balanced effort among the renewable energy technology options in a manner which focusses expenditures on the highest priority scientific and technical investigations.

Solar Research

Question: What are your long range plans in the area of solar research?

Answer: For each of the solar programs, a great deal of effort has been expended in developing a consensus between DOE and industry regarding the collective technical priorities of the public and private sector in advancing these technologies towards viability. These priorities are employed by DOE in making its annual budgetary decisions. While various economic factors such as the general health of the economy or the price projections of competing supply technologies, or the annual resources available to either private or public researchers, will effect the timing of technology viability and the pace of progress toward R&D objectives; the priorities remain relatively constant. It remains the Department's view that the solar technologies offer considerable promise for diversification within the energy supply system and for becoming an increasingly important component of the energy supply mix over the long term.

Solar Program

Question: Based upon the level of proposed funding, it looks as though you are eliminating the solar program. Do you intend to phase this program out? If so, do you have a predetermined timetable?

Answer: The solar program is not being eliminated or phased out. In every area of applied R&D, deficit reduction has prompted us to critically examine all of our solar projects and make tough decisions involving technical priorities. DOE believes that it is important over the long term to supply a mix of technologies to sustain a balanced effort among the renewable energy technology options in a manner which focusses expenditures on the highest priority scientific and technical investigations. At this time it appears that most of these technologies will require further public and private investment in R&D in order to reach viability. The FY 1987 budget request reflects a commitment on our part to fund the more basic and longer term research most suited to public investment and of broader payoff to industry in the longer term. The request will support moving forward in each of the priority areas of each renewable technology and DOE has no specific plan at this time to terminate our funding participation according to a defined timetable.

Privatization of Solar Programs

Question: What evidence, if any, do you have that the private sector is ready to pick up the ball in this area?

Answer: The Renewable Energy industry is comparatively new and is extremely broad in scope ranging from elements of established major industries to more entreprenurial interests dedicated to pursuing individual technologies. Data concerning the specific financial capabilities and intent of individual firms is both proprietary and comparatively sketchy and assessments of industrial capability must therefore represent professional judgements on our part based on our ongoing dialogue with industry counterparts. It is our view that industrial interests will remain involved with solar R&D under the DOE funding requests and that the technical progress which can be accomplished under public and private investment will maintain a competitive domestic industrial base. The financial risk sharing that could be achieved through cooperative R&D ventures would have a goal of achieving greater private sector R&D support.

Energy Conservation

Question: Your proposal for the Energy Conservation Research and Development program amounts to more than a 75% cut when carryover funds are discounted. Again, how do you justify such a dramatic cut when your overall program is not decreasing?

Answer: Reductions have been taken in Conservation programs and in most other civilian R&D programs such as Nuclear, Renewables, and Fossil Energy. No one program was singled out for budget cuts. Carryover funds should not be discounted because they are included in our planned program level. The reductions in the Conservation programs have been taken across all technologies and end-use sector programs in a balanced way. We will continue to address a balanced portfolio of technologies, using the monies requested for FY87 and funds for which we have requested deferral, while at the same time contributing to the Administration and congressional goal of reducing the Federal budget deficit.

If we are to achieve our overriding goal of deficit reduction we have no choice but to concentrate scarce resources where they will show promise of bringing the greatest benefits, and we have made a careful attempt to do so. We believe that we have made the right choices and that we will have a conservation R&D program that will prove adequate to the task of providing a solid technology base upon which industry can build.

Question: Does a sufficient technology base exist for the development of new products and processes for the commercial market or is there still significant work to be done in this area?

Answer: As an R&D organization, we believe, of course, that there will always be a need for continued technical progress. Therefore, the FY87 budget request for

Conservation research and development will continue a balanced R&D program directed towards longer term, higher payoff efforts to create a baseline of new knowledge and technology to allow the private sector future options for the development and commercialization of new products.

This research will provide a foundation upon which industry can build long into the future. The technology base upon which industry is currently building is constantly evolving, both as a result of our R&D and that of the private sector, and is providing industry with the knowledge necessary for continued improvements.

Question: What will be the impact on the universities and other institutions that have been conducting this research? Are they at a stage where their programs can be curtailed or shut down in an orderly manner?

Answer: Reductions in Conservation R&D budgets will impact all participants in the program. Since most of the university work and that of the National Laboratories has been directed toward more basic research, efforts to target resources towards more generic research should help to mitigate the impact on universities and other institutions. Where programs must be terminated we are attempting to do so in an orderly manner.

QUESTIONS SUBMITTED BY SENATOR MATTINGLY

Question: Mr. Secretary, I want to commend the Department of Energy for its involvement, through the Biological Energy Research (BER) subprogram, in supporting complex carbohydrate research activities. As I have expressed in the past, I believe that research in this area is of critical importance to this Nation and its future.

As the Secretary is aware, last October the University of Georgia established a Complex Carbohydrate Research Center which has attracted Dr. Peter Albersheim and his team of distinguished scientists to the University. Major financial support of the team's research has been provided through competitive grants within the Biological Energy Research program for years.

In October and December, I requested that the Department of Energy give serious consideration to providing federal support to the University of Georgia's Complex Carbohydrate Research Center as part of its Fiscal Year 1987 budget request. I note that the Departmental budget request acknowledges the importance of complex carbohydrate research. Specifically, the request states that the funding levels suggested by the Department will allow for enhanced support for ongoing projects in complex carbohydrate research. In addition, it states that an effort will be made to "respond to a few of the numerous very high quality research opportunities presently available in these areas."

The University of Georgia clearly represents one of these "very high quality research opportunities," perhaps the highest. Will specific consideration be given to substantial, ongoing support for the University of Georgia's Complex Carbohydrate Research Center? What portion of BER program funds are set aside for these "research opportunities"? When and how will specific allocations be made?

Answer: The Biological Energy Research program of the Office of Basic Energy Sciences expects to continue in a leadership role in respect to complex carbohydrate research in this country. The University of Georgia projects on complex carbohydrates have been considered by the Office of Basic Energy Sciences in the category of "very high quality research opportunities". As a reflection of this, the DOE program increased its funding of the projects in FY 86 over FY 85 (FY 86 $430,000 versus FY 85 $419,456) despite an overall reduction in the Biological Energy Research subprogram within the Basic Energy Sciences program's budget. In addition, the DOE, through its university equipment program, awarded Dr. Albersheim on a competitive basis a sizable mass spectrometer and associated lab computers ($345,000) which were transferred from the University of Colorado to the University of Georgia. Further, we are planning, in close collaboration with the Complex Carbohydrate Center in Athens, an international workshop for this coming summer on the needs for developing an information data base of structures of complex carbohydrates.

Specific consideration will be given to on-going support to the University of Georgia's Complex Carbohydrate Research Center. As a matter of fact, a site visit review in Athens of the research program with peer reviewers is already planned for July of this year. The amount of funds in FY 87 that can be set aside for research opportunities will depend on the appropriation received from the Congress and prior commitments to ongoing research projects. The Department's procedure for awarding funds is based on scientific merit as determined by peer review, as well as programmatic needs. Specific plans for allocations are made principally in the first half of the fiscal year. In the case of the Complex Carbohydrate Center at the University of Georgia, we plan to set a level of support for FY 87 soon after the beginning of the new fiscal year starting this October.

SUBCOMMITTEE RECESS

Chairman HATFIELD. The hearing will be recessed until tomorrow at 2 o'clock in this same room, when we will review the Tennessee Valley Authority project.

[Whereupon, at 3 p.m. Tuesday, March 4, the hearing was recessed to reconvene at 2 p.m. Wednesday, March 5.]

ENERGY AND WATER DEVELOPMENT APPROPRIATIONS FOR FISCAL YEAR 1987

TUESDAY, MARCH 11, 1986

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 2:05 p.m. in room SD–192, Dirksen Senate Office Building, Hon. Mark O. Hatfield (chairman) presiding.

Present: Senators Hatfield, Abdnor, Kasten, Mattingly, and Domenici.

DEPARTMENT OF ENERGY

SOLAR AND RENEWABLE ENERGY PROGRAMS

STATEMENT OF DONNA R. FITZPATRICK, ASSISTANT SECRETARY FOR CONSERVATION AND RENEWABLE ENERGY

OPENING REMARKS

Chairman HATFIELD. The hearing will please come to order.

This afternoon we continue our examination of the fiscal year 1987 budget request for the Department of Energy. We will receive testimony from three principal witnesses on the request for the solar and renewable programs, next the Department's energy and research activities, and finally, a request for the agency's environmental program.

As our first witness, we welcome Donna Fitzpatrick, the Assistant Secretary for Conservation and Renewable Energy.

Madam Secretary, I believe you have come now in your own right, rather than acting in this role. We congratulate you on that, and your full statement will be placed in the record. If you care to highlight it or summarize it, we will be very happy to hear from you.

Miss FITZPATRICK. Thank you, Mr. Chairman. I would like to summarize.

SUMMARY OF STATEMENT

I appreciate the opportunity to appear before you today and to discuss the fiscal year 1987 budget request for the renewable energy programs of the Department of Energy. The budget for these programs is consistent with the goals and objectives of national energy policy and is fully responsive to the administration and congressional goals of deficit reduction.

57-567 O—86——4

The administration's overall energy goal is to foster an adequate supply of energy at reasonable cost. Achieving this goal will require that we make full use of our Nation's vast natural resources and the daring and ingenuity of its citizens.

Deficit reduction is perhaps the preeminent domestic economic imperative today, and the Department fully recognizes that fact. For this reason, we are doing all we can to concentrate increasingly scarce resources on those programs and projects that directly fulfill a responsibility of the Federal Government and truly require Federal assistance. If we are to achieve our overriding goal of deficit reduction we have no choice but to concentrate scarce resources where they show promise of bringing the greatest benefits.

As we seek ways to gain the greatest benefit from our limited resources, we will investigate cooperative research and development ventures with private industry consortia. This approach to R&D funding has the potential to provide greater leverage of Federal resources and more effective technology transfer. We have had a number of successes in the last year, and in order to continue to contribute to the achievement of our goals, our 1987 budget request for renewable energy R&D will continue to support development of a mix of technologies that can contribute to both energy supply and improved energy efficiency.

SUMMARY OF BUDGET REQUEST

I would like to briefly summarize our budget request.

Renewable energy is an important part of the Nation's energy supply mix. In fact, renewable energy based sources—solar, biofuels, wind, ocean, hydropower, and geothermal—now supply about 8 percent of the energy consumed in the United States. When the federally supported renewable energy program began in 1974, most of the technologies were either in the conceptual stage or existed in limited, primitive form. During the past decade, major advances have been made in all of the renewable energy technologies. New materials have been developed with thermal, optical, and physical properties required for lower cost and higher performance.

New components have been tested and substituted for less effective ones; extensive systems analyses have been performed, and hundreds of systems have been studied in both laboratory and field conditions. Teams of scientists and engineers in Government laboratories, universities, and industry have created solid technology bases, and the expertise that we require in the broad array of disciplines pertaining to renewable energy technologies. As these various technologies continue to develop, their economic and technological viability will improve, along with their collective contribution to the Nation's energy needs. In order to support this development, we will continue to address a range of fundamental issues.

These include basic materials-related work on the structural integrity of reflective surfaces, and the conversion efficiency of photovoltaic materials; resolution of wind technology reliability and durability issues through advancement of underlying structural and aerodynamic theory; the resolution of environmental uncertainty attendant to combustion of municipal wastes; research in biological health effects and risks associated with exposure to high-voltage electric and magnetic fields; and the feasibility of using magma energy as a geothermal energy source for power generation.

The proposed fiscal year 1987 budget request for renewable energy programs totals $108 million.

Mr. Chairman, I believe that this budget will contribute to increased energy supply diversity and energy efficiency and will serve to promote increased competition in the marketplace.

This budget request maintains program goals and will allow us to address the items of highest priority in research and development in the field of renewable energy, thereby adding to the accomplishment of our national goal of fostering an adequate supply of energy at reasonable cost.

This is a budget which I believe recognizes today's fiscal responsibilities, as well as tomorrow's anticipated needs and will build on the foundation of energy stability and security that we, working together with the Congress, have laid in the last 5 years.

Mr. Chairman, we are pleased to have the advice we have received from the Congress and, in particular, this subcommittee, and we thank you for the opportunity to appear here today.

Chairman HATFIELD. Thank you for your fine statement.

[The statement follows:]

STATEMENT OF DONNA R. FITZPATRICK

Mr. Chairman and Members of the Subcommittee:

I appreciate the opportunity to appear before you today and discuss the FY 1987 budget request concerning the Department's Renewable Energy and Electric Energy Systems and Energy Storage programs. The budget for these programs is consistent with the goals and objectives of national energy policy and is fully responsive to the Administration and Congressional goals of deficit reduction.

The Administration's overall energy goal is to foster an adequate supply of energy at reasonable cost. We can achieve that goal through the combination of energy stability, energy security, and energy strength. Energy stability has been achieved over the past five years. Our energy security is growing stronger day by day. Our objective for the immediate future is to build this Nation's energy strength, making full use of its vast natural resources and the daring and ingenuity of its citizens. Our approach includes supporting advances in energy conservation as well as possible energy supply sources of the future such as renewable energy.

Deficit reduction is perhaps the preeminent domestic economic imperative today and the Department fully recognizes that fact. For this reason, we are doing all we can to concentrate increasingly scarce resources on those programs and projects that directly fulfill a responsibility of the Federal government and truly require Federal assistance. If we are to achieve our overriding goal of deficit reduction we cannot afford to continue to allocate scarce Federal resources to activities where the rationale for continued Federal involvement is weak and where State and local organizations or private industry can and should take over responsibilities presently borne by the Federal government. Also, we cannot permit programs or projects to continue with Federal support unless they meet a high priority national need. We have no choice under the current and necessarily strict fiscal regimen but to concentrate scarce resources where they show promise of bringing the greatest benefits.

As we seek ways to gain the greatest benefit from our limited resources, we will investigate cooperative research and development ventures with private industry consortia. This approach to R&D funding has the potential to provide greater leverage of Federal funds and to assure that resources for applied R&D are focused on high priority areas where there is private commitment to follow through with promising technologies. It can also foster increased technology transfer by involving industry earlier in the R&D sequence. One of our early steps will be the publication of a general solicitation of industry interest in forming R&D ventures in the various conservation and renewable energy program areas.

In order to contribute to the achievement of our goals, the FY 1987 budget request for Renewable Energy, Electric Energy Systems, and Energy Storage programs will continue to support development of a mix of technologies that can contribute to both energy supply and improved end-use efficiency. The FY 1987 budget request for Renewable Energy R&D programs under this subcommittee's jurisdiction totals $108.0 million; $16.2 million for Electric Energy Systems and Energy Storage, $90.2 million for Renewable Energy programs and $1.5 million for general policy and management support.

RENEWABLE ENERGY OVERVIEW

The availability of stable and secure sources of energy will continue to play an important role in sustaining a robust domestic economy. The Department's renewable energy programs reflect a continuing national commitment to diversify U.S. sources of energy supply in a manner that fosters free market choices. Renewable energy can be an important part of the nation's energy supply mix and renewable technologies are already making important contributions to national, regional, and local energy requirements. These contributions are possible since the family of renewable energy technologies spans a wide range of resource and technical options at varying stages of maturity. Some technology and resource combinations have been providing substantial energy for many years, others are just beginning to enter the supply system, and some remain in research phases.

Renewable energy technical progress has been paralleled by an increasing level of confidence in and commitment to these technologies by the private sector. The renewable industry has made significant progress in recent years to its development into the diverse group of many small businesses and sizable divisions of large companies that we see today. There has also been progress with respect to the other institutions concerned with renewable energy supply and use. States have become increasingly involved with promoting renewable energy use, while universities, research institutes, and utilities are promoting awareness and conducting programs to further advance our knowledge of renewable energy potential.

Within the current Federal budget limitations, it is the Department's objective and role to participate in the highest priority research to address the most critical technology base issues. The focus of such efforts will be on those technologies with the greatest long-term promise for contribution to the nation's energy supply mix. These efforts will emphasize precompetitive research critical to advancing technology while avoiding interference with the extraordinary capacity of industry to develop specific commercial products and services. The Department will continue to encourage private sector participation and leadership and will seek input from industry and other institutions in the selection of projects which have the greatest relevance and potential.

SOLAR BUILDINGS

Solar buildings technologies have continued to make inroads in housing and, to a lesser degree, in the commercial buildings sector. These technologies can presently supply up to 40% of the energy required to heat individual homes across the United States. There is increasing scientific evidence that such energy contributions could be doubled and extended to additional types of building requirements for energy supply by means of continued opportunity for technological innovations. The FY 1987 Solar Buildings Technology Program budget request of $4.7 million for operating expenses will provide industry with an essential technology base for developing the new materials, components, and technologies required to realize this potential.

Working closely with industry and university laboratories, the Solar Buildings Program is conducting long-term, cross-cutting research which the diverse sectors of the industry cannot support. The goal of these research activities is to increase the energy contribution of solar technologies to the point where 70% to 80% of space heating, hot water, cooling, and lighting requirements of various types of buildings could be supplied at costs that are competitive with conventional fuels.

The FY 1987 program in materials and components includes continued research on new optical and thermal switching films that control solar gain and thermal losses for windows and exterior building surfaces. Research on innovative collectors will increase their thermal efficiencies and reliability, decrease their cost, and expand the application of active solar technologies to cooling systems and other building energy requirements.

New phase change materials incorporated in such conventional building materials as wallboards will make it possible to store and use thermal energy provided by solar energy in all parts of the building. Advanced thermal transport concepts will enable energy to be transferred from the point of collection at the building exterior to any interior location, thereby improving the energy performance of solar building systems.

Systems research activities encompass both residential and non-residential building applications. Research on open cycle solar absorption and solar desiccant cooling technologies will be aimed at increasing their energy efficiencies, the key to achieving viable solar cooling applications. An important element of the FY 1987 systems research program is the development of analytical tools to allow architects and engineers to predict system performance. Researchers will also continue to monitor, analyze, and evaluate the performance and reliability of solar building technology. Analysis techniques are being developed for integrating these solar technologies with conventional heating and cooling systems.

PHOTOVOLTAICS

Photovoltaics (PV) is on its way to becoming a significant energy supply option. The partnership between DOE and industry has resulted to date in rising conversion efficiencies, increasing reliability, and lower costs, all of which have helped the technology to establish a strong foothold in the competitive energy market, with a broad range of viable applications. In FY 1987 the Photovoltaic Program, with a budget request of $19.6 million for operating expenses and $1.0 million for capital expenses, will seek to advance the basic understanding of technical issues associated with materials formation and physical phenomena of the PV cell.

Amorphous silicon is an attractive thin-film photovoltaic material that could establish PV technology as a broadly competitive electric power production option. U.S. research leads worldwide efforts in addressing the issues leading to the optimization of single junction submodules and the investigation of higher efficiency multijunction concepts. The efforts will lay the ground work for a viable industrial effort capable of achieving 10 percent efficiency single junction and 13 percent multiple junction large area submodules.

Polycrystalline thin films also represent promising candidates for meeting the major programmatic criteria relating to cell efficiency, material processing requirements, and performance stability. Progress has been made in the development of low cost deposition methods, and in cell efficiency. FY 1987 efforts will concentrate on defining the scientific and technological barriers to approaching theoretical efficiency and on the development of large area film fabrication concepts for the most promising of these materials.

As a result of DOE's program, single-crystal gallium arsenide and single-crystal silicon solar cells currently hold records for the most efficient photovoltaic conversion of sunlight to electricity. But the efficiency of such materials is inherently limited because not all incident sunlight can be utilized due to the frequency selectivity of the specific materials involved. To overcome this difficulty, researchers are exploring concepts that will include seeking improvements in selected single-junction cells as well as studying concepts to mechanically or optically couple cells or to fabricate, as one structure, two or more cells of different materials. The goal of this high priority effort in high efficiency concepts is to achieve 35% efficient small area cells for use by industry as part of its development effort.

The FY 1987 program will also maintain its unique capability for precise measurement of material and cell parameters. This work at SERI guides researchers throughout the U.S. in understanding and correlating observed physical phenomena. The program will also support other fundamental research in quarternary and ternary compounds, and promote basic material work at universities. Finally, the wealth of information gathered by the program from materials to systems during its ten years of research and development will be used to assist industry in its efforts to bring photovoltaic technology to competitive maturity, domestically and internationally.

SOLAR THERMAL TECHNOLOGY

The technology base for solar thermal technology has dramatically improved as a result of significant achievements within the last two years. These achievements include substantial system cost reductions and performance enhancement due to the research in advanced solar thermal components and subsystems which resulted, in part, from DOE's cooperative efforts with industry. At present, solar thermal technologies are capable of delivering electricity at 13¢/kWhe. However, solar thermal technology must be capable of 5¢/kWhe for electric power production and $9/MBtu for thermal energy in order to be competitive with a mix of other energy generating technologies.

The FY 1987 program, with a budget request of $15.3 million for operating expenses, emphasizes activities which address the component and subsystem improvements/advances necessary to approach these objectives. Heliostat sizes have increased three- to four-fold, while costs have been reduced by 40% since Solar One (Barstow) became operational in 1982. The stretched membrane concept has the potential to further reduce the heliostat field and parabolic dish concentrator costs by another 50%. The FY 1987 research will continue the design and testing of these advanced concepts.

Central receivers using molten salt or sodium as heat transfer fluids would allow reductions in the size of advanced receivers and enable the development of low pressure receivers that are lighter in weight with lighter support structures. The new fluids can also be stored at high temperature and low pressure for plant operation during long hours of reduced insolation. Research efforts in this area to-date have established the basis for reduced receiver and storage costs by 50%, improving both the overall plant cost and levelized energy costs of solar thermal systems. The development and testing of these advanced subsystems will continue through FY 1987. The Vanguard dish module has proven the high conversion efficiency of sunlight to electricity by achieving a 29% net (31% gross) system efficiency using a kinematic Stirling engine. Development of the free-piston Stirling engine concept, in cooperation with NASA, will continue in FY 1987. This engine has the potential to achieve the long-term goals of high reliability and performance at competitive cost. Additional research projects which are underway and will continue in FY 1987 include the development of a thermochemical cell in which spent chemicals would be regenerated by solar energy to produce electricity. Additionally, several present methods for producing solar thermal electricity generating systems are limited to operation below 750°F due to excessive thermal losses. Researchers will continue to study approaches for replacing the sensible heat transport methods with thermochemical energy transport and storage processes which have the potential to dramatically reduce thermodynamic losses and thereby increase overall efficiency. Experiments addressing the technical feasibility of thermochemical transport will also be undertaken.

BIOFUELS

Biofuels energy technologies utilize a variety of organic feedstocks, such as terrestrial and aquatic crops and municipal waste, which can be converted by thermochemical and biochemical processes into high-value gaseous, liquid, and solid fuels. Biofuels currently are supplying approximately 2.7 quads or almost 4% to the U.S. energy supply. Development of advanced biofuels technologies offers the potential for significant additional contributions over the longer term. The FY 1987 budget request for Biofuels Energy Systems is $11.6 million for operating expenses and $0.6 million for capital equipment. During FY 1987, the Biofuels Program will focus on key long-range research and development issues to provide a technology base for private sector development of biofuels production and conversion technologies.

Feedstock production research supported within the Budget Request in short-rotation intensive culture will include genetic selection to improve biomass yields, along with examination of monoculture plantings to determine operational yields and susceptibility to disease and pests. Research on herbaceous energy crops will focus on screening of promising species that can be grown on marginal croplands, as well as small-scale experimental plots. Aquatic species research will include species screening, genetic research, and small-scale experiments to improve the productivity of microalgal species and the efficiency of conversion processes.

Thermochemical conversion research will focus on liquefaction and pyrolysis of biomass feedstocks to produce high-value liquid and gaseous fuels. Municipal solid waste research will continue to address the production of liquid and gaseous fuels via thermal liquefaction and gasification. Combustion kinetics and emissions research will also be conducted.

Research in biochemical conversion will focus on improving processes for conversion of organic materials to alcohol fuels in order to advance the technology for competitive production of octane enhancers and additives for transportation fuels. Research in the anaerobic digestion of municipal waste will address the improvement of microorganisms, as well as attempt to understand the biochemistry and physiology of the anaerobic digestion process.

WIND ENERGY

Updated information, recently received, indicates that there are presently over 13,000 wind turbines operating in the U.S. with an installed capacity greater than 1100 MW. However, many areas remain where continued research efforts are needed to establish the knowledge base necessary for industrial development of viable wind technology within the context of evolving competitive and unsubsidized electric energy supply markets. It is the objective of the Wind Energy Research Program to improve the understanding of fundamental atmospheric fluid flows and their effects on wind turbines and to translate this understanding into tools that industry can use to design and develop improved, more reliable, cost competitive wind turbines. The FY 1987 budget request of $8.1 million for operating expenses and $.2 million for capital equipment will fund the research required to accomplish these objectives.

Commercial development that started at the 50 kw size has now moved into the 100-200 kw range. With the success of those tests and the current successful operation of the larger Mod-2 experiments, sufficient data is now available to industry to proceed with larger systems. The large experimental Mod-2 and Mod-5 projects will be closed in FY 1987 to concentrate resources on fundamental structual and aerodynamic research to benefit all system sizes. Major improvements in turbine energy capture are believed to be achievable through aerodynamics research activities. Tests on specially instrumented commercial machines will continue in order to collect actual operating data in a wide range of environments. This will improve the understanding of the performance of different turbines' energy capture as it is affected by turbulence, wakes, and micro-siting and will further the development of air foils tailored to wind turbine requirements.

FY 1987 structural dynamics research activities will improve the understanding of how aerodynamic loads induce structural stresses and rotor and tower material fatigue. Research efforts are aimed at the development of predictive models which take into account the complex interactions of forces on wind machines. Cooperative field assessment activities with industry are used in this area to acquire the data necessary to verify theories.

Advanced component development involves the application of basic science and research on aero and structural dynamics to develop components that could lead to major improvements in the energy production of advanced wind turbines. This area also includes studies on environmental effects of wind turbines, application of wind turbines as fuel savers with diesel generators for remote power generation, and on the interaction of wind machines with existing utility power systems.

OCEAN ENERGY

The Ocean Program conducts the research and development of ocean energy technology to a point where the private sector can make competent assessments of whether applications of the technology are viable energy supply alternatives. This will be accomplished through appropriate research on components and systems modelling. The OTEC program is guided by a long-range goal to investigate the technologies which could reduce the capital cost of the OTEC systems to $3200/kWe (1984 dollars). The program strategy focuses on reducing the technical uncertainties associated with a 5-15 MWe, near-shore OTEC system which serves as an approximation of the incremental capacity requirements of the type of markets representing the likely point of initial competitiveness for this technology. The FY 1987 budget request is $2.5 million for operating expenses.

The emphasis of the FY 1987 Ocean Program will be placed on experimental verification and testing and thermodynamic research and analysis. Material and structures research and oceanographic, environmental, and geotechnical research previously undertaken have provided a data base that is useful for the two FY 1987 research areas, but do not currently require the degree of emphasis that was necessary in past years.

The objective of the experimental verification and testing program is to provide a facility for private industry to conduct seawater tests and experiments which verify OTEC component functional feasibility, performance, and operational characteristics on a scale which can be extrapolated for use in modular systems applicable to small plants. The FY 1987 budget will also provide funds to upgrade the Seacoast Test Facility by expanding the capacity of its seawater systems for open-cycle OTEC experiments.

One objective of the thermodynamic research and analysis program is to experimentally determine the effects of seawater and non-condensible gas on open-cycle heat and mass transfer processes. The program will also validate selected power system analytical models at a scale sufficient to extrapolate a generic understanding of how to design potentially cost- effective open and latent-heat power systems which could meet the cost goals of the program. Reaching this goal is dependent upon increasing the output of the power system and significantly reducing the life cycle cost.

OTHER SOLAR ACTIVITIES

The FY 1987 budget request for the efforts in support of planned research activities is $8.1 million for operating expenses and $.6 million for capital equipment. These efforts include international, technology transfer, and resource assessment programs, the Solar Energy Research Institute, and program support and direction.

Technology transfer activities such as publications summarizing research results across individual investigations and performing centers are important mechanisms for transferring information to the R&D community in context and provide the basis for facilitating information exchange and dialogue. Additionally, continuing requests are received for information from a more general cross section of the public and the energy community concerning renewable energy. The FY 1987 budget request of $1.9 million for operating expenses and $.1 million for capital equipment will continue the technical and public information services at levels commensurate with solar research and development activities.

The international solar energy program provides Federal organizations and industry with a vehicle for cooperative international trade development for renewable energy. DOE is responsible for chairing an interagency committee, the Committee on Renewable Energy Commerce and Trade (CORECT) which provides a forum where industry and public entities can coordinate the use of existing resources and authorities to exploit export opportunities for the domestic solar energy industry. Additionally, funds are used to conduct a program managed by the Department of Commerce which cost shares, with industry, the development and presentation of exhibitions, special trade missions and trade development services with a continuing focus on international markets of more significant potential. The FY 1987 budget request is $.5 million for operating expenses.

The FY 1987 budget request of $.5 million for the Solar Energy Research Institute will fund capital improvements to the permanent DOE facilities that will improve efficiency, safety and security.

Solar resource assessment activities will provide information regarding the distribution and spectral, and temporal variability of solar energy resources throughout the United States. The FY 1987 budget request for these activities is $.7 million. Coordination of these activities and other ongoing research and development activities is an important part of the program support and direction functions. FY 1987 requests of $.9 million for program support and $4.1 million for program direction funds will, among other things, provide technical and crosscutting studies of the various solar technologies, provide for updates to multi-year program plans, continue technical and programmatic dialogue with industry, and manage the diverse research activities in the national solar research program.

GEOTHERMAL ENERGY

The Geothermal Energy Program carries out research and development, in cooperation with industry, on an array of geothermal resource types (including geopressured, hydrothermal, hot dry rock, and magma) and conversion technologies designed to define the technical and economic boundaries of this vast domestic energy supply resource. Program activities include applied research, technology development, and information efforts which provide the basis for the timely introduction of new concepts and products into the marketplace by the private sector. The FY 1987 budget request for the Geothermal Program is $17.9 million for operating expenses.

The purpose of the geopressured research program is to define the technical characteristics and recoverability of this large resource of hot brine and methane which lies primarily beneath the U.S. Gulf Coast. The FY 1987 program includes experimental well flow testing, tests of the conversion of the combined energy content (thermal and chemical) to electricity, and supporting research on the dynamic response of geopressured reservoirs to production conditions, chemical constituents of the brine, and the possibility of land subsidence.

Hydrothermal research will allow the expansion of the accessible resource base through an improved understanding of the processes for extraction and reinjection of geothermal fluids; new materials capable of withstanding high temperatures, high pressures, and highly corrosive environments; brine chemistry research leading to techniques to prevent plugging of wells and pipes; advanced power cycle technologies; field testing techniques for appraising very high temperature geothermal reservoirs at the Salton Sea Scientific Drilling Project; and the experimental study of survey methods applicable to young and andesitic volcanoes.

Hard rock penetration research will be performed jointly with industry to improve the technology and reduce the uncertainty of geothermal well drilling, that currently represents about half of the cost of geothermal power and exceeds the cost of typical petroleum wells by factors of two to four due to the fact that geothermal wells are generally deeper, and encounter harder rock, higher temperatures, and more corrosive fluids than do oil and gas wells. Experimental programs include high-pressure water jets combined with rock cutters, mechanics of rock penetration, and drilling fluid loss control.

Research will also be carried out to determine the depth and size of a large continental magma chamber, to evaluate alternative methods of energy conversion, and to develop materials and instrumentation capable of operations in the 1000 degree Celsius magma environment.

Hot dry rock research involves the evaluation of the properties of deep crystalline rock and the development of methods to extract geothermal heat from such resources. In FY 1987, the experimental extraction of heat from the large fractured reservoir at Fenton Hill, New Mexico, will begin and research on improved diagnostic technologies including microseismic measurements will be extended to higher temperatures.

GEOTHERMAL RESOURCES DEVELOPMENT FUND

The Geothermal Resources Development Fund was established to broaden the geothermal energy technology base by guaranteeing loans for private sector development of several state-of-the-art facilities. The FY 1987 request is $72,000, which allows for evaluating projects, restructuring existing guarantee agreements, and monitoring outstanding loans.

HYDROPOWER

Small-scale hydropower technology is nearing maturity, and the DOE program has succeeded in providing the necessary technology base to industry. Therefore, no funds are requested for FY 1987. Ongoing contracted analytical and technical support will begin to phase out. The remaining technology development and R&D projects will then be monitored by DOE personnel to ensure that contractual and reporting requirements are met. By the end of FY 1986, seventeen of the nineteen technology development projects will be on-line, with the remaining 2 becoming operational in FY 1987. The low-cost crossflow turbine and free-flow turbine R&D projects are expected to go on-line in FY 1986 and the siphon penstock R&D project will be operational in FY 1987.

ELECTRIC ENERGY SYSTEMS

The Electric Energy Systems Program conducts research to establish a technology base that will lead to advanced concepts and materials that will enable future electric networks to meet the national security need for a reliable electric supply while maintaining the health and safety of society. The Program supports research to resolve mid-to long-term problems in order to ensure that the biological health effects and risks to life forms exposed to high-voltage electric and magnetic fields are well understood and mitigated; to provide options that will ensure appropriate system reliability and promote the efficient use of resources in the Nation's future electric network; provide electric power over a wide range of system conditions including both normal and emergency situations, and to improve the efficiency of electric systems through the development of new materials, advanced controls, and new design concepts. The FY 1987 budget request is $7.6 million for operating expenses.

Researchers in reliability R&D activities will continue to assess the potential impact of a nuclear electromagnetic pulse on the Nation's electric network and to provide advanced techniques for control and protection of systems during normal and abnormal operations. In FY 1987 the reliability research will include a second-level impacts assessment.

Funds requested in the systems technology research activity are required to meet contractual obligations to complete several current programs. New materials research will be carried out on liquid dielectrics and semiconductors.

ENERGY STORAGE

The Energy Storage program is developing a technology base for advanced energy storage and conversion systems that will facilitate the use of abundant but intermittent energy sources. Three promising energy storage technologies are now being pursued: battery (electrochemical), thermal, and chemical/hydrogen. The FY 1987 budget request for the Energy Storage program is $8.6 million.

The battery storage technology base research activities encompass fundamental research with the objective of providing the basis for improvements in efficiency, power density, energy density, and lifetime in new electrochemical couples and small-scale fuel cells. In FY 1987, the aims of the technology base research will be to provide a better understanding of the complex phenomena that determine electrochemical activity; explore new electrochemical couples with improved performance characteristics; develop improved materials and new components for advanced battery technologies to solve key technical problems; and identify new, low-cost catalysts for electrochemical energy conversion systems.

The objectives of the advanced development activity include development and evaluation of high-performance, long-life, economical batteries for future mobile and stationary energy storage applications. In FY 1987, the exploratory technology development activities will concentrate on investigating key problems in sodium/sulfur batteries which have the potential for providing up to five times the energy storage capability of conventional batteries. Research will include identifying new materials and designs for electrolytes and electrodes.

The thermal and mechanical energy storage activity will provide the technical underpinning for the more effective use of thermal energy sources and improving the efficiencies of chemical/hydrogen production and storage. Activities in FY 1987 will emphasize chemical/hydrogen research on high-temperature electrolysis and advanced storage options to achieve lower cost in hydrogen liquefaction. The thermal storage program will conduct research on form-stable phase-change materials in the high-temperature range and will explore advanced storage concepts.

CONCLUSION

Mr. Chairman, I believe that the budget that I have summarized will contribute to increased energy supply diversity and end-use efficiency and should serve to promote increased competition in the marketplace. I believe that this budget request will allow us to address the items of highest priority in research and development in the fields of renewable energy and electric energy systems and energy storage thereby contribute to the accomplishment of our national goal of fostering an adequate supply of energy at reasonable cost. This is a budget which I believe seriously recognizes today's fiscal responsibilities, as well as tomorrow's anticipated needs.

Thank you for the opportunity to present our budget request.

BIOGRAPHICAL SKETCH

DONNA R. FITZPATRICK

Donna R. Fitzpatrick was nominated by President Reagan on July 31, 1985, and confirmed by the Senate on December 19, 1985. She was sworn in as Assistant Secretary for Conservation and Renewable Energy, U.S. Department of Energy (DOE) on December 20, 1985. She had served as Acting Assistant Secretary since March 11, 1985, and as the Principal Deputy Assistant Secretary since January 1984.

In this position her responsibilities include management of research and development programs in energy efficiency and alternative fuels for industry, buildings, and vehicles. The programs in renewable energy resources involve research in active and passive solar, photovoltaic, wind, ocean thermal, geothermal, and biomass technologies. In addition, she administers federal grant programs for low-income home weatherization and energy efficiency improvements in schools and hospitals, and coordinates management of three of the five federal power marketing administrations.

In 1983, Miss Fitzpatrick served on a consultant team for the Secretary of Energy to conduct a general review of the Department's conservation and renewable energy programs, focusing on policy, program goals and priorities, budget levels, and new initiatives. In 1980, she served the Office of the President-elect as a member of the Transition Team for the National Science Foundation, reviewing national policy in basic science research, project efficiency, funding, and proposed legislation.

In her law practice, first with the Washington, D.C., firm of O'Connor and Hannan and then as a sole practitioner, Miss Fitzpatrick worked extensively on real estate development, helping to coordinate public and private interests and activities where Federal and District of Columbia involvement was required. This included work with local utilities and engineering planners to determine the legal, economic, and technical feasibility of various energy options, such as solar, cogeneration, and an on-site power generation and district heating system for large scale, high density residential and commercial uses.

Miss Fitzpatrick is also experienced in civil litigation, including administrative law and contracting issues.

Miss Fitzpatrick received a Bachelor's degree in physics cum laude from the American University in 1972. After teaching high school chemistry and mathematics, she entered law school and graduated from the National Law Center of George Washington University in 1980.

January 1986

CONTRIBUTION OF RENEWABLES

Chairman HATFIELD. Last year in your testimony, you indicated that the contribution of the renewable energy sources to the overall supply base was growing and very important. I wonder if you have any new statistical data that indicates the trend line along this subject. Help us to appreciate, perhaps, a little bit more the contribution of renewables.

Miss FITZPATRICK. Mr. Chairman, we do continue to analyze and try to project what the future contribution of renewable energy technologies will be. The trend line is growing. It is increasing and will continue upward for decades, as far as we have projected it.

The Department does this kind of projection in connection with developing its national energy policy plans, and I would be very pleased to supply the subcommittee with a copy of those projections.

Chairman HATFIELD. We would be very happy to receive that for our files.

[The information follows:]

NATIONAL ENERGY POLICY PROJECTIONS

Based on information available to the Department, renewable energy contributed 8 to 8.5 percent of national primary energy supply in 1984. The difficulty of attempting to make dependable forecasts in a highly unpredictable future has been discussed within the energy community on numerous occasions and remains a valid consideration. From the information available to the Department it appears that renewable energy may represent some 9 percent within the next 5 years and 10 to 10.5 percent of the supply mix by the year 2000, and is projected to reach 13 to 14 percent of domestic primary energy supply by the 2010 timeframe. These estimates, of course, reflect a number of highly uncertain economic and energy assumptions.

A copy of the NEPP IV projections through the year 2010 will be provided to the subcommittee. NEP V projections should be completed shortly and will be provided to the committee at that time.

[CLERK'S NOTE: NEPP IV projections can be found in the subcommittee files.]

GOVERNMENT'S ROLE IN RENEWABLE ENERGY

Chairman HATFIELD. Ms. Fitzpatrick, could you give us a general assessment of how much of a role the Federal Government has played in this growing and important contribution of the renewables vis-à-vis the apporpropriations to make available for grants research and so forth, and the tax policy that has been pursued, the tax investment credits and incentives?

Miss FITZPATRICK. If I could take the research contracting and grants issue first, I think the Department, the Federal Government, has a vital role to play in the further development of these technologies, so that they will become technically reliable and economically competitive, so that they can fulfill the potential of satisfying our energy supply needs.

That is why we are continuing to concentrate on the issues which involve fundamental science or a high-risk option, which has large potential payoffs, because those are the areas that private industry finds very difficult to support.

Sometimes they don't have the wherewithal, either economic or technical, to pursue the very fundamental scientific issues. Sometimes they don't have sufficient economic incentive to take the high risks, even in view of long-term payoffs.

So we are concentrating our research programs in that area. I think that is vitally important for the future energy security of the Nation.

TAX CREDIT ISSUE

With regard to the tax credit issue, we know that the tax credits, when they were first passed, were intended to be a transitional provision. That is why they had an end period.

In 1984, we had supported the continuation of those tax credits for a short time in a kind of phased schedule to complete that transition period.

We feel that on the tax reform proposal, which was submitted by the President last year, we have done a great deal to assist small businesses which are typical of the renewable energy industry, and in the interests of tax simplification and also because of the benefits to small businesses, we do not support the continuation of tax credits.

However, we now find ourselves in the position where we have neither tax credits nor any reform yet on the books of the tax system. So I would be the first to admit tax credits are not there and neither is any other assistance to the industry.

They are clearly going to suffer somewhat from that. We have also seen evidence that those parts of the industry which have worked hard to improve their technologies, to market aggressively, and to deliver the product and good value for the money they are charging seem to be able to continue to function and to prosper.

Chairman HATFIELD. Even though it would be difficult to quantify, would you call the Federal role significant?

Miss FITZPATRICK. In the R&D area, certainly, yes, very significant.

Chairman HATFIELD. Which, in turn, creates that growing base of contribution.

Miss FITZPATRICK. That is correct, yes.

SOLAR AND RENEWABLES FUNDING REQUEST

Chairman HATFIELD. Madam Secretary, in spite of this rather remarkable record, I note that the budget for the solar and renewables was cut in about half. I believe it came down from about $145 to $72 million.

May I ask you—and I solicit this as information on behalf of the committee—what was the figure that was requested of OMB during the budget preparation period for this year's budget?

Miss FITZPATRICK. It was approximately twice what the request is.

Chairman HATFIELD. Around $144 million?

Miss FITZPATRICK. Approximately that, yes, $143.8 million.

COOPERATIVE RESEARCH AND DEVELOPMENT VENTURES

Chairman HATFIELD. Would you describe for us that part of your testimony where you refer to the idea of the new innovative cooperative R&D approach, the joint R&D ventures between industry and the Federal Government?

Miss FITZPATRICK. Yes; in the last few years, there has been growing interest in industry in doing cooperative partnerships in research and development.

We think that there is a distinct possibility that these could be a very good tool for the Federal Government to use, both to leverage the available Federal dollars and to enhance technology transfer.

So although we have not allocated specific dollars for such cooperative ventures, because we think that is still a little premature, we do want to investigate with industry their interest in working with us under that kind of a format.

Chairman HATFIELD. How would you implement that?

Miss FITZPATRICK. We will be asking industry whether they are interested in participating when we have more definite proposals and what the cost figures would be. Then we would come to the Congress and ask for those funds, probably through reprogramming. What we might be doing is replacing some of the R&D work that we are doing, the same types of subject areas, with this new kind of funding mechanism, which would bring more private dollars to bear on the project.

Chairman HATFIELD. Let me refer to page 17 of your budget justification material. You indicate, and I quote, "This approach is intended for more technology transfer to allow broader research support."

Could I ask you, in your opinion, what renewable resource activities would benefit the most from this particular approach?

Miss FITZPATRICK. I think that the industries that would tend to benefit the most from it would be those that are most mature and have the participation of financially muscular companies, if you can say that.

There are a number of companies that are very well established in energy and in other industries which are in the renewable energy industry also, a number of them oil companies. In particular, a number of electrical engineering companies, such as Westinghouse, are getting into various renewable energy technologies, principally, photovoltaics, geothermal, and some wind, and also in solar thermal technologies. All of those, I think, are potential candidates for that kind of a cooperative venture.

Chairman HATFIELD. Did the joint venture idea originate in OMB?

Miss FITZPATRICK. I honestly can't tell you where it originated, Mr. Chairman.

Chairman HATFIELD. It wouldn't be beyond the possibility, if I tied or linked the possibility of it originating in OMB in light of the funding level that is now before us? It would be reasonable or——

Miss FITZPATRICK. Possible.

Chairman HATFIELD. Possible?

ADDITIONAL PREPARED QUESTIONS FOR THE RECORD

I have some other questions I will submit to you for the record if you would respond to them in writing.

[The questions and answers follow:]

QUESTIONS SUBMITTED BY SENATOR HATFIELD

Biofuels

Question: Provide the Committee with a breakdown of the budget request using the FY86 format of short rotation intensive culture, production research, thermochemical conversion, biochemical conversion, regional program, and capital equipment with FY85, 86 and FY87 levels for each area.

Answer: The following chart, which provides a breakdown of the actual and planned budget for the biofuels program, is submitted for the record.

(Dollars in Millions)

	FY 1985 Budget Authority	FY 1986 Adjusted Appropriation	FY 1987 Request
Short Rotation	$2.8	$3.60	$2.5
Production Research	4.6	3.60	2.7
Thermochemical Conversion	11.8	8.90	3.3
Biochemical Conversion	6.6	6.85	3.1
Regional Program	4.0	3.80	0
Capital Equipment	1.0	.58	.6
	$30.8	$27.33	$12.2

Question: Congress provided $4 million last year for the Regional Biomass Program. What is the request for FY87? What is the reason for the reduction? Do you anticipate greater cost-sharing to provide the additional funding - from what source? Please provide a breakdown of how the reduction will be allocated in each of the regions with funding levels for FY86 and FY87.

Answer: No funds are requested for FY87 for the Regional Biomass Program because this program has matured to the point where federal involvement is no longer required. Activities which promote the use of biomass on a regional basis can be assumed by the individual states, local municipalities, and the private sector. An increase in cost-sharing by the program participants can be expected in the future. The following chart, which provides a breakdown of the FY86 and FY87 budget, is submitted for the record.

Regional Program
(Dollars in Millions)

Region	FY86	FY87
Northwest	$1.200	0
Southeast	.950	0
Northeast	.695	0
Great Lakes	.555	0

Question: How much is requested in FY87 as compared to FY86 for municipal waste activities? Provide an explanation of the proposed activities with a funding breakdown for each year.

Answer: In FY86, $5 million was appropriated for municipal solid waste activities. This funding was allocated approximately equally between biochemical and thermochemical research. The bioconversion research of municipal solid waste to liquid and gaseous fuels includes research with industry to gain an understanding of the migration of gases through a landfill surface and research on techniques to dewater municipal wastewater sludge. Additional research includes work on feedstock preparation systems and environmental concerns.

The FY87 biofuel planning includes $2.3 million relating to Municipal Solid Waste Technology, which will be used to continue research on liquefaction, pyrolysis and combustion of Municipal Solid Waste as well as anaerobic digestion and landfills for the production of methane.

Question: For the record, provide a detailed explanation and the funding levels in FY86 and FY87 for alcohol fuels activities.

Answer: The funding levels for alcohol fuels in FY86 and FY87 are $3.9 million and $2.2 million respectively. The alcohol fuels program conducts research on the most promising technologies for the conversion of wood or MSW to alcohol fuels. Wood has three major components, cellulose, hemicellulose and lignin. This program is addressing the problems involved in maximizing the conversion of these componets into alcohols or other gasoline compatible fuels. Such research includes acid hydrolysis and enzymestic hydrolysis of cellulose and hemicellulose to sugars, and subsequent fermentation to alcohol as well as chemical conversion of lignins to gasoline compatible octane enhancers.

Question: What is the status of the RefCom facility?

Answer: The refuse conversion to methane, RefCom, facility in Pompano Beach Florida, was dismantled in December 1985. In FY 1986 the Biofuels program working with industry will complete its cost-shared, research and development of this energy from municipal waste system which anaerobically digests solid waste to produce methane. Assuming the successful completion of research this year, the contractor and the Gas Research Institute have reached a tentative agreement to develop a full scale demonstration RefCom facility.

Question: Please provide a breakdown, and explanation of the decrease in FY87 as compared to FY86 biochemical conversion.

Answer: The funding levels for biochemical conversion in FY86 and FY87 are $8.1M and $3.1M, respectively. The decreased level of funding is primarily due to completion of RefCom research, phasing out of waste water treatment R&D, a decrease in work on effluent dewatering and focusing acid and enzymatic hydrolysis R&D on the most promising processes.

Photovoltaics

Question: Discuss briefly the progress and accomplishments of the PV industry over the last 5 years.

Answer: During the past five years, the PV industry has grown significantly in those activities not supported either by direct government purchases or subsidized by major tax credits. Most of the U. S. manufacturers' 1985 sales of 8.5MW were without government help. Also during this period, four U.S. manufacturers have entered the amorphous silicon commercial market, and several companies have either entered or expanded into the photovoltaic manufacturing equipment market. It is expected that announcements of new and improved products will be coming forth in the very near future.

Question: Provide the Committee with a breakdown of the budget request using the FY86 format including Materials Research with Amorphous silicon, Single-junction High-efficiency Materials, Multiple-Junction and High-efficiency concepts, Related Materials; Advanced Silicon sheet, University and new ideas research; Collector Research with collector efficiency and collector simplification research; System research; and capital equipment with FY 86 and FY 87 funding levels for each area.

Answer: The planned funding levels in requested format for FY 1986 and FY 1987 are submitted for the record:

(Dollars in Millions)

	FY 1986 Adjusted Approp.	FY 1987 Requested
Materials Research	$28.97	$19.60
Amorphous Silicon	(11.40)	(7.20)
Single-Junction High-efficiency Materials	(1.67)	(3.80)
Multiple-Junction & High-efficiency concepts	(4.00)	(1.40)
Related materials	(5.40)	(5.20)
Advanced Silicon Sheet	(4.50)	(-0-)
University and New Ideas research	(2.00)	(2.00)
Collector Research	9.50	-0-
Collector efficiency	(6.00)	(-0-)
Collector simplification	(3.50)	(-0-)
Systems Research	1.05	-0-
Capital Equipment	1.15	1.00
	$40.68	$20.60

Question: Explain the request for materials research and any significant changes in the FY 87 program as compared to FY 86.

Answer: The materials research activities are involved with performing research on new photovoltaic materials, improving the quality of the materials to permit high efficiency PV cells to be made, developing new deposition techniques that will permit rapid growth of suitable materials and developing improved materials for contacting and encapsulating thin-films and high efficiency PV cells.

The two most significant changes in FY 1987 from FY 1986 relate to support of the largest element (amorphous silicon) and the mature silicon sheet. The amorphous silicon work will be more intensively cost-shared in FY 1987 from approximately 20% in FY 1986 to approximately 40% in FY 1987. The silicon sheet work is a relatively mature technology and will be completed with the FY 1986 funds dedicated to this activity.

Question: How much is requested for innovative concepts - university research program in FY 87 and how will it be used.

Answer: In FY 1987, $2,000,000 has been requested for university and innovative concepts research. Most of these funds will be used to continue those university grants (5 in number) funded in FY 1985 and to be funded in FY 1986 (approximately 3 in number).

Question: Provide a breakdown of all funding for single-junction thin-film cell R&D with levels of FY 86 and FY 87.

Answer: The funding for single-junction thin-film cell R&D is devoted to three materials; amorphous silicon, copper-indium-diselenide, and cadmium telluride. The funding levels for these activities in FY 1986 and FY 1987 is submitted for the record:

	FY 1986	FY 1987
Amorphous Silicon	$6,000,000	$3,100,000
Copper Indium Diselenide	2,200,000	1,500,000
Cadmium Telluride	1,100,000	500,000
Total	$9,300,000	$5,100,000

The amorphous silicon single junction work is part of the $7.2 million FY 87 funding for all amorphous silicon, and the work on the other materials is part of funding called single junction high efficiency materials.

Question: What is the status of the SMUD project?

Answer: Phases I and II (2MW total) of the project have been completed and are operating successfully. Phase III (5MW) was put out for bid for the PV modules. None of the bid responses were low enough to meet SMUD's cost goals and SMUD decided not to proceed with Phase III construction.

Wind Energy

Question: Please provide the committee with a detailed breakdown of the budget request for wind energy systems using the structure contained in the FY 1986 budget justification material with FY 1986 and FY 1987 funding levels.

Answer: The planned breakdown for wind energy in the FY 1986 structure is submitted for the record:

(Dollars in Millions)

FY 1986 Budget Structure	FY 1986 Adjusted Approp.	FY 1987 Request
o Aerodynamics Research		
--Unsteady flow and aeroelastics	$ 1.04	$ 0.70
--Atmospheric fluid dynamics	1.13	1.05
--Airfoil characterization	0.28	0.60
--Aeroacoustic Research	0.15	0.20
--Cooperative Research with Wind and manufacturers	0.50	1.00
	3.10	3.55
o Structural Dynamics Research		
--Frequency and time domain models	1.85	1.73
--Materials and Fatigue Life	-	0.40
--Experimental Test Bed	3.48	0.50
--Turbine power dynamics and control	2.37	0.40
	7.70	3.03
o Systems analysis	0.51	0.50
o Wind Energy Research Center	1.20	1.00
o Mod-5 Document and Defer hardware	1.30	0.00
o Capital Equipment	0.77	0.17
Total	$14.58	$8.25

Question: Provide the Committee with a status report on the Mod-2 program. Are sufficient funds requested for operational testing?

Answer: The three Mod-2's at Goodnoe Hills are currently operating extremely well. Over 40% of the cluster's 11000 hours of operation has occurred since modifications to the machines were completed in May 1985. Research testing has been underway for the last three years focusing on performance, structures, environment, wind turbulence, and wake effects and is fulfilling its objectives. Thus, experimental operation and research testing is planned to be completed this summer. Sufficient funding to support operational testing during FY 1986 is available. We are now developing plans for disposition of the three machines during the FY 1987 time period, and additional funds are not required.

Question: What is the current status of the Mod-5B Project?

Answer: The Mod-5B design is complete and fabrication of all major hardware has been completed. The concrete foundation and the tower have been installed at the site in Hawaii. Under the Department's deferrals, the retained funds would allow documentation of the design and transfer of the vast accumulation of large machine technology (Mod-5B and its predecessors) to industry.

Question: Please discuss the activities proposed in FY 87 which are directed at assisting smaller wind technologies.

Answer: The Federal Wind Energy Program activities proposed for FY 87 are directed at generic questions affecting any type of wind systems and have three main elements. First, the program will sponsor basic research on the science of wind turbine dynamics. This research is needed to understand the random nature of the wind resource itself, its complex inter action with the wind turbine, and the effects of this interaction on performance and reliability. Second, advanced components and systems research will be conducted. This research will establish the technology for advanced components, such as high performance airfoils designed specifically for wind turbine operation. The program will verify research results through testing on DOE test beds and through the cooperative field test programs on commercial machines (mostly small machines) with private industry. Finally, the program will transfer the research results to industry for use in developing cost-effective wind turbines and to user groups such as small machine manufacturers, as well as electric utilities.

Question: Comment on the level of support in FY 1987 and the need for the Wind Energy Research Center.

Answer: The Wind Energy Research Center at Rocky Flats was consolidated with the Solar Energy Research Institute in 1985. It is now managed by SERI and is responsible for managing most of the program's generic wind research and projects formerly assigned to SERI, Rocky Flats and NASA Lewis (except for the Mod-5 program). Staff is composed of wind researchers already at SERI, some previously from the Rocky Flats Plant, and several senior researchers from academia and industry. Funding for SERI wind research will be five to six million dollars in both FY 1986 and 1987. Activities include on-site research, management of field research projects at industry and government sites, operation of unique facilities such as dynamometers, test pads for atmospheric testing, and acoustic and data reduction equipment. The unique facilities of the Wind Energy Research Center are available to industry under a user designated facility concept that permits industry to operate the equipment under a cost-reimbursable basis and to keep resulting data confidential. Industry's response to the user designated facility concept has been enthusiastic. SERI also manages the cooperative field test program with industry, principally small wind systems, from this facility. Estimated cost of maintaining the Center is roughly $1,000,000 per year.

Question: What new activities and funding are proposed in FY 1987 as compared to FY 1986 for structural dynamics research and aerodynamics research?

Answer: The FY 1987 proposed program reflects the programmatic structure, technical issues, and strategy developed in the recent Multi-Year Program Plan. The budget proposals continue our efforts to better understand the basic physics of wind turbines and to develop better models and technology that industry can apply. We plan to continue cooperative research with industry in the field and at the same time to address key issues such as dynamic stall, in wind tunnels and field experiments. The only new activities in the FY 1987 request are in the structural dynamics area to investigate how turbulence-induced loads are distributed along a turbine blade and how this impacts fatigue. The level of effort for this is approximately $500,000.

Question: How much is requested in FY 1987 as compared to FY 1986 for vertical axis research?

Answer: Total level of effort at Sandia for vertical axis research is estimated at $1,000,000 in FY 1987, compared to $4,500,000 in FY 1986. The majority of the FY 1986 funds, approximately $3,000,000 was, however, used to complete the new 34 meter vertical axis test bed which will be ready for use in FY 1987.

Solar Thermal

Question: Please provide the Committee with a detailed breakdown of the budget request for solar thermal under the FY86 structure contained in the FY86 justification material.

Answer: The Solar Thermal Technology activities budget breakdown is submitted for the record.

	(Dollars in Millions)	
Activity	FY 86 Adjusted Approp.	Request FY 1987
Collection Technology		
Optical Materials	$ 1.800	$ 1.100
Concentrators	3.945	2.450
Receivers	3.941	3.350
	9.686	6.900
Conversion Technology		
Heat Engines	2.632	2.000
Direct Conversion	.830	.200
Transport & Storage	1.220	.600
	4.682	2.800
Systems & Applications Technology		
Innovative Concepts	1.461	0
Balance of Plant	.642	1.000
CR Systems	3.430	1.550
DR Systems	1.209	.900
Systems Experiment	3.250	1.900
	9.992	5.350
Planning & Assessment	1.236	.250
Capital Equipment	.289	
Total	$25.885	$15.300

Question: Congress has provided funding for repowering design activities in the past. What is the status of this effort?

Answer: There were thirteen conceptual designs completed in the initial repowering design activities. From these, four were eventually selected to proceed to preliminary design and Rockwell/Pacific Gas and Electric were finally selected to complete final design. Due to the changing economic perspectives and increased cost estimates to complete the construction phase, the final design effort was terminated by mutual agreement prior to completion. The remaining funds are being applied to implement the proposals submitted by the Western and Southwestern utilities.

Question: How much is requested in FY87 for parabolic dish research and technology development? Please provide a breakdown.

Answer: The breakdown for parabolic dish research and technology development is:

° Low cost advanced concentrators	$ 1,400,000
° Advanced receiver and module development	850,000
° Heat engine development	1,500,000
° Direct conversion	500,000
° Chemical transport research	600,000
° System test and evaluation	900,000
Total	$ 5,750,000

Question: What is the status of the 10 MW Central Receiver Project at Barstow, California?

Answer: Solar One completed its test and evaluation phase on August 1, 1984, and began its three-year power production phase at that time under the Cooperative Agreement between the Department of Energy and Southern California Edison and the Associates. Solar One is operating more efficiently with each year of the power production phase. In the first year of power production operation, a total of nearly 8000 MW hrs was produced. The current production is running 50% higher than the previous year and on winter solstice, December 20, 1985, the power production for that day exceeded the goal established by 12%. Further operational improvements are anticipated in the third year of operation. The conclusion of the third year operations on August 1, 1987 will end the activities to be accomplished under the existing cooperative agreement between the Department of Energy and Southern California Edison, (SCE).

Question: How much is included in FY 1987 as compared to FY 1986 for small business and university research?

Answer: In FY 1986 small business and university obligations were 13% and 9% of the budget, respectively. It is planned to maintain about these percentage levels in FY 1987.

Question: Explain the amount requested for balance of plant research?

Answer: A primary research and development task within the balance of plant category is for automation and control system development. The funds requested will continue design and evaluation of advanced controls for the Small Community Solar Experiments and the Central Receiver Test Facility which are being performed in FY 1986.

Question: Explain in detail with funding levels, the collaborative efforts which are proposed for parabolic dishes, scaled up central receivers, and automated control systems.

Answer: In FY85 and 86 two contractors, Solar Kinetics Inc. and Science Applications International Corporation, developed $150m^2$ stressed membrane heliostats for Central Receivers. The LaJet Company has been developing a multifaceted aluminized stretched membrane parabolic dish. Research and development results on silver polymer coatings have indicated attractive lifetimes can be attained. Based on these results, it is planned to issue a Program Opportunity Notice (PON) for industry to design and build large parabolic dishes. The Department plans to allocate $1,000,000 in FY 1987 toward this cooperative activity.

In FY 1986, testing of a Central Receiver cavity receiver was completed at the CRTF. A new and more manufacturable design has been fabricated and should be ready for testing in June 1986. This was a cooperative cost shared program with industry. In FY 1987, testing will be completed on this receiver and design of a new optimal external receiver will be completed. The final selection of the optimal receiver will be made as a result of the utility studies to be performed by Southern California Edison, Pacific Gas and Electric and Arizona Public Services. $1,000,000 is planned for central receiver scale-up testing.

Advanced control and plant automation systems for central and distributed receiver systems are being evaluated in FY 1986. Design and evaluation of advanced controls for Small Community Solar Experiments and the CRTF will be continued in FY 1987. The utilities, as part of their proposed cooperative public planning studies for Central Receiver Technology, will study these systems. Based on these assessments it is anticipated that the government can enter into a cooperative research and development contract with industry. $300,000 has been allocated in FY 1987 to initiate this activity.

Building Systems

Question: Provide a detailed breakdown with funding levels for FY86 and FY87 of your program, including the categories within materials and components research and systems research and development.

Answer: The information requested for the Solar Buildings Program is submitted for the record.

Program Category	(Dollars in Millions) FY86 Adjusted Approp.	FY87 Request
Materials & Components:		
Aperture and Building Surface Materials	$1.650	$1.200
Thin-film Polymer/ Foil Collector	.390	.150
Evacuated Tube Compound Parabolic Concentrator (CPC) Collectors	.250	.100
Thermal Storage and Transport Materials	.900	.350
Chiller and Dessicant Materials and Components	1.310	.800
Systems:		
Non-Residential Buildings	2.100	1.200
Residential Buildings	1.100	.900
Capital Equipment:	.481	None
Total Solar Buildings	$8.181	$4.700

Building Systems

Question: What is the request proposed for experimental systems research?

Answer: Materials and components developed in laboratory-scale experiments tend to operate very differently in full-scale occupied buildings because many new variables (e.g. time-response of the building to solar radiation and outdoor temperature changes) are introduced in full-scale buildings. The goal of the experimental systems research is to determine and optimize the actual performance of materials and components in a setting that reasonably approximates actual building use. For these experiments existing full-scale test facilities are used, including those at the National Bureau of Standards, Colorado State University, and the Florida Solar Energy Center. After such experiments are completed results are provided to industry to guide their product development activities.

Technology Transfer

Question: There seems to be much less emphasis placed on technology transfer in the FY 87 request and the line item is cut by over 30%? Why?

Answer: The technology transfer line item provides for (1) publication of technical reports for the research and development community, (2) operation of referral services for scientific as well as public inquiries, and (3) response to general requests for information. The technology transfer activities funded within these areas reflect the overall level of DOE research activity and general levels of public inquiry and as a result, have been reduced consistent with reductions proposed for the technology research programs.

Essential services and important research information will continue to be available to technical and general inquiries.

International Solar

Question: In view of recent comments about the importance of international trade development of solar technologies why do you propose to reduce this program?

Answer: We believe that international trade development of solar technologies is a high priority effort. In spite of budget reduction pressures, DOE has retained $200,000 FY 1986 Budget Authority to add to prior year funds to support international activities such as the export promotion program at the Department of Commerce (DOC) and new activities under the aegis of the interagency Committee on Renewable Energy Commerce and Trade (CORECT). For FY 1987, DOE has requested $500,000 for Solar International, to be used to continue the DOC program and initiate further CORECT activities.

SERI

Question: Discuss your plans to expand SERI's role in the solar and renewable area?

Answer: SERI serves a unique role as the lead solar energy R&D center. Currently SERI is the Nation's only major Federal facility concerned exclusively with research in solar energy. The Institute's scientific breadth and depth in solar R&D lends itself to efficient technology transfer and integration of activities across the family of solar technologies. These characteristics have allowed the fostering of SERI's broad participation in solar energy. While all funding to institutions will be updated annually on the basis of best match between program objectives and laboratory capabilities; SERI will play an important role in the program for the foreseeable future.

Question: Why are you proposing reductions in funding for SERI in FY 1987?

Answer: The Department's budget recommendations for solar energy are formulated with the goal of maintaining the scientific and technical momentum established over the past several years. By concentrating Federal outlays on the type of basic research appropriate for public investment, reductions in Federal expenditures can be attained. The FY 1987 budget request funding for SERI is 38% of the total Renewable Energy request as opposed to 28% for FY 1986. Assignments of research responsibility and fundings to SERI, as is the case with other research entities, will be periodically reviewed to ensure that the best match is continued between laboratory capabilities and program goals and technology objectives.

Program Direction

Question: Provide a breakdown among the solar activities of the proposed reduction of FTE's in FY 87.

Answer: The following information, which is submitted for the record, is solar energy proposed energy staffing reductions:

SOLAR ENERGY PROGRAMS
PROPOSED STAFFING REDUCTIONS

Programs	FY 1986 Actuals On-Board	FY 1987 Request
SOLAR ENERGY		
Solar Buildings	15	10
Photovoltaics	20	18
Solar Thermal	18	14
Biofuels	15	11
Wind/Ocean	15	13
Alcohol Fuels	5	4
TOTAL SOLAR ENERGY	88	70

GEOTHERMAL R&D

Question: What level of funding is requested and comment on recent developments in the Hot Dry Rock project.

Answer: Five million dollars is requested in FY 1987 for Hot Dry Rock geothermal energy development. Further support is anticipated through the International Energy Agency Hot Dry Rock cooperative program, under which Japan is providing $2.5 million and is assigning scientists and engineers to the Fenton Hill Hot Dry Rock project in FY 1986. In May, 1985, an underground connection was achieved at Fenton Hill which will allow recirculation of water through a large fractured reservoir. Tests thus far have indicated that the flow impedance is low and therefore favorable for proceeding with heat extraction tests. However, the heat extraction capability is not yet known and will be established by extended circulation experiments.

Question: Why do you proposed to terminate hydrothermal industrialization activities?

Answer: Prior year funding for the hydrothermal industrialization program element has supported State geothermal resource assessment studies. This program element has achieved its objective in that the States have now developed sufficient capabilities to plan and carry out any additional resource assessment activities they identify that may be necessary to meet any future requirements.

Question: What funding is proposed for magma energy extraction and how does your program differ from the FY 86 activities?

Answer: One million dollars is requested for magma energy extraction in FY 87. In FY 86, research is being carried out to develop materials and instrumentation capable of withstanding the hostile environment expected in the magma regime as well as to analyze the results of past geophysical measurments made at Long Valley, in east-central California which has been selected as the location for the next field test. In FY 87, the analyses will be completed, and drilling of an observation well for detailed studies of the magma chamber under Long Valley will begin.

Question: What is the status of the geopressured resource program?

Answer: Geopressured program field activities are continuing at the two design wells used to study the behavior of geopressured reservoirs under extended flow conditions. The Gladys McCall well near Lake Charles, LA is operating satisfactorily. Using a newly devised scale control technique, flow rates of up to 30,000 barrels per day have been sustained for prolonged periods without indications of scale problems. The Pleasant Bayou well near Houston, TX is presently undergoing renovation to allow testing of the Electric Power Research Institute energy conversion system to begin in FY 87. A third geopressured well, the Hulin well near Lafayette, LA, which was donated by industry for possible testing, is in standby condition pending the result of analyses of future reservoir testing needs. Research to develop mathematical models for prediction of reservoir dynamics and to evaluate possible environmental effects of geopressured energy utilization is continuing in support of the field program.

Geothermal Loan Guaranty Program

Question: Provide a status report on this program including pending applications and follow-on loans.

Answer: The geothermal loan guaranty program was established by Congress in 1974 and was subsequently provided with a loan guaranty authority of $500 million. In a March 1982 Federal Register notice, the Department noted that existing guaranties and pending applications exceeded the loan guaranty authority and therefore suspended applications for new projects. Since that time some of the pending applications have been approved and the rest withdrawn.

There have been several successes under this program. For example, the Northern California Power Authority (NCPA) repaid their loan early, and then without a government guaranty constructed a second power plant at The Geysers. Another success was Geothermal Food Processors, which recently paid off its loan in full.

Due to changed economic conditions which have arisen since certain of the loan guaranties were signed -- decreased oil costs and lower than anticipated demand for electricity -- three projects have gone into default, of which two have been paid off by DOE in the total amount of $29 million.

Of the $500 million loan guaranty authority, $244.4 million in guaranties have been issued to date on a total of 8 projects. In addition, conditional commitments to 2 projects total $99.8 million, bringing the total authority committed under this program to $344.2 million.

GENERAL

Question: For the record, provide the Committee with a breakdown of funding for solar and renewable programs for FY 80 through FY 87.

Answer: The following information is provided for the record:

RENEWABLE ENERGY BUDGET HISTORY (ERDA and DOE)
Budget Authority in $1000's

Programs	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	FY 1986 Adjust. Approp.	FY 1987 Request	CUMULATIVE TOTAL
I. SOLAR ENERGY									
Solar Bldgs	84,850	68,600	22,100	11,650	16,450	9,185	8,181	4,700	221,016
Photovoltaics	150,045	133,200	74,000	58,035	50,275	54,649	40,678	20,600	560,882
Solar Thermal	143,200	120,020	55,950	49,500	43,681	33,895	25,885	15,300	472,131
Biofuels	55,000	45,200	30,500	21,000	28,250	30,031	27,326	12,200	237,307
Wind Energy	60,555	54,200	34,400	31,400	26,367	28,355	24,825	8,250	260,102
Ocean Energy	43,000	34,600	20,800	10,500	5,463	4,008	4,811	2,500	123,182
Other-Solar	34,515	15,986	30,474	19,850	10,523	11,464	12,918	8,742	135,730
TOTAL SOLAR ENERGY	571,165	471,806	268,224	201,935	181,009	171,587	144,624	72,292	2,010,350
II. GEOTHERMAL ENERGY	149,202	137,521	69,904	57,628	30,270	29,698	26,681	17,930	500,904
III. HYDROPOWER	20,939	3,198	3,000	2,000	750	447	481	0	30,815
IV. ELECTRIC ENERGY SYSTEMS	37,340	39,923	24,500	17,200	18,500	19,717	11,548	7,619	168,728
V. ENERGY STORAGE SYSTEMS	66,300	71,800	42,000	25,700	25,700	18,642	17,292	8,600	267,434
TOTAL RENEWABLE R&D	844,946	724,248	407,628	304,463	256,229	240,091	200,626	106,441	2,978,231
GEOTHERMAL RESOURCES DEVELOPMENT FUND	181	(20,698)	2,301	0	2,200	121	69	72	(15,754)

Electric Energy Systems

Question. Please provide the Committee with a complete breakdown of the FY 1987 request using the format contained in the FY 1986 justification material on Page 133-136 and include FY 1986 levels.

Answer. The breakdown is submitted for the record.

DEPARTMENT OF ENERGY
FY 1987 CONGRESSIONAL BUDGET REQUEST
KEY ACTIVITY SUMMARY

Electric Energy Systems Program
(dollars in thousands)

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
Electric Field Effects			
-- Biological Research A.C.	o Continued developing 3-D model of electric fields in whole bodies and into mechanisms interacting in cells and tissues. Continue joint American/Japanese behavioral research project on non-human primates. Continued research on developing the human health analysis methodology needed to evaluate the health effects from human exposure to 50/60 Hz electromagnetic fields. ($3,900)	o Complete 3-D modeling while continuing research on interacting mechanisms in cells and tissues. Continue CRIEPI behavioral research and effort to determine impact of electric and magnetic fields on humans and small animals. Continue developing human health analysis (e.g., assessing negative data applications). ($2,287)	o Continue to analyze and determine effect of a.c.-induced magnetic fields on humans. Continue CRIEPI project, as well as developing risk analyses methodology. ($2,000)

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
-- Bi[illegible]gical Research D.C.	o Continued d.c. ion propagation research specifically to develop measuring techniques for electric field, ion density, and net aerosol charge to off-ground positions. ($800)	o Continue ion propagation analysis and impact on biological elements. ($600)	o Continue identifying mechanisms interacting with respiratory system; continue investigation of impact of magnetic fields. ($600)
Subtotal - Electric Field Effects	($4,700)	($2,887)	($2,600)
Reliability R&D			
-- EMP Impact Analysis	o Completed EMP transient coupling analysis and initiated research on insulation breakdown in nanosecond timeframe. Continue characterizing EMP-induced effects. ($3,000)	o Complete EMP simulation and initial assessment studies. Continue at slower pace impact assessment while postponing identifying hardening/suppression options. ($2,042)	o Continue second level impacts assessment on potential system damage at stretched-out schedule for principal contract postponing all work on hardening/suppression options. ($1,000)

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
-- Normal/Emergency Operating Concepts	o Continued developing real-time concepts to detect and mitigate abnormal operating conditions. Initiated impact study of microprocessor controlled relays and harmonic propagation. ($1,200)	o Continue development of advanced microprocessor computer technologies and on-line stability and recognition research. ($845)	o Continue on-line stability studies. Delay posturing and adaptive protection research. ($800)
-- Failure Mechanisms	o Continued research on fundamental understanding of aging of dielectric insulating materials. Conducted investigation on extruded dielectrics using thermal stimulation. ($300)	o Phase out research program. ($0)	o No activity.
Subtotal - Reliability R&D	($4,500)	($2,887)	($1,800)

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
Systems Technology			
-- New Materials	o Continued research on dielectric and magnetic materials and initiated research into developing new high-power semiconductor and other materials to enhance transient suppression. ($1,700)	o Continue at a significantly slower pace research on dielectric materials focusing on semiconductor materials and conducting polymers. ($600)	o Continue research focusing on interfacial phenomena in liquid dielectrics and semiconductors. ($800)
-- Automation/ Processing Concepts	o Initiated research on distributed intelligence and control. Continued fiber-optic technology application study and Athens Automation and Control Experiment. ($1,340)	o Continue Athens Automation and Control Experiment. Complete wind farm integration research and continue fiber-optics study at a stretched out schedule. ($900)	o Close-out Athens and terminate all studies. ($720)

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
-- Superconducting Technology (Advanced Cable Research)	o Completed transient impulse testing of the superconducting generator and initiated evaluation. Completed full load and continued impulse testing/evaluation of superconducting cable. Initiated spin-off technology assessment. ($1,600)	o Complete analysis and finalize documenting superconducting generator and cable research activities. Close out ambient cable (spin-off insulation) assessment. ($900)	o Close out all research activities. ($600)
-- High-Voltage D.C. Research	o Began investigating new protection and control concepts and assessed future HVDC research to identify low-cost HVDC component and system development control options. Continued development of test methodology for HVDC compressed gas-insulated cables. ($1,921)	o Close out research assessing protection and control alternatives. ($75)	o No activity.

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
-- BEST/Load Leveling	o Continued assessing and testing candidate advanced batteries. ($700)	o Discontinue funding the BEST facility. Evaluating future prototype designs of advanced battery systems for utility load leveling will be discontinued. ($0)	o No activity.
-- Hawaii Deep Water Submarine Cable	o Continued to fabricate and design laboratory cable. ($800)	o Reshape program. Previously appropriated funds will be used to complete design and laboratory testing. ($0)	o No activity.
-- Technical Support and Program Requirements	o Continued basic program requirements. ($1,800)	o Continue at a reduced level activities required for change in portfolio. Eliminate support for HBCU's. ($1,029)	o Lowest level of support required. Closing out project and transferring information to private sector. ($749)
Subtotal - Systems Technology	($9,861)	($3,504)	($2,869)

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
Capital Equipment	o Provided laboratory equipment for Electric Field Effects. ($224)	o No activity.	o No activity.
Program Direction	o Provided for 6 FTE's ($432)	o Provide for 6 FTE's ($356)	o Provide for personnel ($350)
Electric Energy Systems			
TOTAL	$19,717	$9,634	$7,619

Question. What is the status of the Hawaiian Deep Water Cable project?

Answer. The Hawaiian Electric Company (HECO) has made significant progress in determining the technical feasibility of the deep water cable system for interconnecting the Hawaiian islands of Oahu and Hawaii. The development of the extensive laboratory test program for verifying the design of the selected deep water cable is well underway. The laboratory test protocol, which describes in complete detail all the electrical and mechanical tests to be performed on the test cable, will be completed by May 1986. HECO's cable subcontractor (Pirelli Cable Corporation) is fabricating 6,000 feet of the selected cable needed to perform the tests described in the protocol. The cable fabrication is scheduled for completion in July 1986. The oceanographic bottom survey cruise for collecting measurements of actual bottom roughness of the Alenuihaha Channel was highly successful. The cruise started late in October and was completed on November 7, 1985. Good quality, high-resolution data was obtained which did not indicate the presence of any catastrophic bottom conditions to prevent laying a submarine power cable in the channel. Data reduction was completed and several potential cable routes have been identified where additional surveys should concentrate. Future bottom surveys will be conducted as part of the State program and will provide the remaining data to complete the planning for the at-sea test.

Question. What is the total appropriated for this program and are there any unobligated balances?

Answer. To date, a total of $10.754 million has been appropriated to the HDWC program. Of this total, $9.354 million has been obligated to the prime contract with HECO and $1.4 million has been obligated to the support contract with the VSE Corporation. Consequently, there are no unobligated funds.

Question. How much is needed in FY 1987 to continue the project?

Answer. DOE has not requested Congress to appropriate additional funds for the HDWC program in FY 1987. DOE believes that in these times of budgetary constraints the previously appropriated funds will go a long way toward achieving the program's object of determining the technical feasibility of a deep water cable system for interconnecting the Hawaiian islands of Hawaii and Oahu.

Question. In the FY 1987 budget, what are your plans for the BEST facility?

Answer. Due to cutbacks in funding by the Electric Power Research Institute (EPRI) and the Department of Energy in FY 1986, a slowdown in demand, and delays in receiving batteries to be tested caused by the reductions and slowdowns in the battery development program over the last three years, the operating agreement with the utility (Public Service Electric and Gas) that runs the facility will be terminated in May 1986. Consequently, the facility will not operate in FY 1987 and no funds are requested.

Question. Explain your proposal for HVDC research in FY 1987 compared to FY 1986.

Answer. The HVDC research, consisting of the assessment of protection and control alternatives for multi-terminal systems, was phased out in FY 1986. There are no research activities planned for the HVDC area in FY 1987.

Question. Do you propose any funds in FY 1987 for new materials research?

Answer. The FY 1987 request for new materials is $800,000. The requested funds will be used to continue research in gaseous dielectrics (determination of the toxicity of by-products from sparked sulfur hexifluoride gas mixtures and investigation of HVDC ion chemistry), interfacial phenomena in liquid and solid dielectric materials, and semiconductors.

Energy Storage

Question. How much is requested in FY 1987 for zinc/bromine activities compared to FY 1986?

Answer. In FY 1986 $200,000 was requested for zinc/bromine battery activities. In FY 1987 no funds are requested for these activities.

Question. Provide a detailed breakdown of the FY 1987 request in terms of the FY 1986 structure.

Answer. The breakdown is submitted for the record.

DEPARTMENT OF ENERGY
FY 1987 CONGRESSIONAL BUDGET REQUEST
KEY ACTIVITY SUMMARY

Energy Storage Program
(dollars in thousands)

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
Battery Storage Technology Base Research -- Electrochemical Phenomena	o Investigated effect of temperature on electrode kinetics and studied electrode restructuring phenomena. Continued investigation of degradation and failure mechanisms in beta"-alumina electrodes and methods to mitigate these degradations. ($1,850)	o Establish scientific engineering principles applicable to batteries and electrochemical systems. The work will include: (a) electrode morphological studies, chemical/structural analysis; (b) transport phenomena, electrode thermodynamics; (c) modeling of electrochemical cell kinetics and cell and battery systems; and (d) use of advanced physical and chemical methods applied to electrochemical research. ($2,415)	o Continue research to establish scientific/engineering principles applicable to batteries and electrochemical systems including: the morphology of zinc-electrode deposits from flowing acid electrolytes. Continued studies to combat oxidation of carbon substrate in oxygen electrodes which limits life and to protect current collectors from chemical attack by sulfur and polysulfides. ($1,540)

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
-- Materials and Components	o Performed research on corrosion-resistant materials and low-cost, light-weight structures, for use in batteries. Evaluated cells incorporating electrically conducting polymers in electrode structures. Also evaluated conducting polymers as electrolytes in lithium cells ($1,500)	o Identify, characterize and improve materials and components for use in batteries and electrochemical systems. Research will include: (a) ceramic, molten-salt, glass, and polymeric electrolytes; (b) novel electrode structures; (c) new components fabrication techniques; and (d) battery separators and current collectors. ($2,500)	o Stretch out the research on ceramic glass and polymeric electrolytes for use with lithium and sodium negative electrodes as well as improved separator and current collector materials. ($1,731)
-- Electrocatalysis	o (This activity was funded under aluminum-air during FY 1985.)	o Conduct research on: (a) alloy or redox electrocatalysts; (b) catalyst reduction in solid polymer electrolytes; (c) non-equilibrium phase electrocatalysts; and (d) anode electrocatalysts. ($900)	o Continue research of effective catalysts for oxygen reduction and generation in alkaline and acid electrolytes; develop atomic level understanding of complex electrochemical reactions of electrode surfaces. ($630)

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
-- Advanced Battery Research	o Evaluated performance of prototype lithium-sulfur dioxide, molten salt, and organic electrolyte lithium cells. ($500)	o Perform at a reduced pace research on new electrochemical couples with the potential to meet or exceed advanced battery and electrochemical system performance goals. Investigations will include: (a) inorganic electrolyte ambient-temperature lithium cell; and (b) rechargeable lithium cells containing a polymeric electrolyte such as polyethylene oxide. ($200)	o Continue research on polymeric lithium ion conductors as electrolytes in rechargeable ambient-temperature lithium cells. ($400)
-- Corrosion Research	o Performed research toward developing new corrosion resistant oxides or other coatings for use on positive current collectors in high-temperature molten-salt and solid-electrolyte cells. ($910)	o Continue research on new corrosion-resistant coatings for use in advanced battery systems. ($200)	o No activity.

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
-- Fuel Cells (Electrochemical Conversion)	o Continued research aimed at reducing catalyst loading on electrodes and on development of non-noble metal catalysts. Investigated improved reformer. ($1,646)	o Continue research needed to develop methanol and alkaline electrolyte cells as efficient, nonpolluting power sources for transportation. Investigate reformer catalyst. ($655)	o Continue to investigate higher efficiency fuel cells for transportation. ($400)
-- Aluminum/Air	o Continued research to identify an aluminum alloy with low rates of corrosion and acceptable performance for use as an anode; constructed prototype module to define system performance; continued work on metal catalysts for air electrodes used in aluminum-air batteries. ($1,846)	o Close out research of a prototype power cell using ambient-air oxygen as the positive material and a low-cost metal as the negative material. ($900)	o No activity.

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
Exploratory Development and Testing			
-- Sodium/Sulfur Battery (Alkali Battery Research)	o Continued to conduct research to provide technology needed to increase life and reliability of this high-energy battery by investigating improved corrosion-resistant case material, developing stronger electrolytes, and evaluated new cell designs to improve freeze-thaw resistance. Also analyzed cell interconnection strategies and thermal control techniques to maximize battery survival of cell failures. ($4,447)	o Continue to investigate corrosion-resistant, high-performance coatings for cell containers, develop new method for the synthesis of beta"-alumina electrolytes and cells and modules to demonstrate increased life and reliability and confirm cell and module failure mechanisms. ($2,458)	o Complete sodium-sulfur core research addressing freeze-thaw failures, thermal management, and corrosion-resistant containers. ($2,000)
-- Zinc-Bromine Batteries	o Continued investigating long-term stability of polymeric materials and active materials for the potentially low-cost, high-energy zinc/bromine battery. ($1,700)	o Finalize core development research specifically addressing low-cost electrode and battery materials with attractive properties. ($786)	o No activity.

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
-- Battery Testing and Post-Test Analysis	o Continued testing or prototype sodium/sulfur and zinc/halogen batteries at NBTL. Provided feedback to program managers and developers on performance, limitations, and failure modes of advanced batteries. ($1,000)	o Continue testing of advanced batteries at NBTL and extend test and post-test analysis to determine suitability for various applications and to guide future developments and/or design modifications. Provide additional scientific and engineering information on failure mechanisms. ($900)	o No activity.
-- Capital Equipment	o Provide essential equipment. ($490)	o Provide essential equipment. ($192)	o No activity.
Subtotal - Battery Storage	($15,889)	($12,106)	($6,701)

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
Thermal and Mechanical Energy Storage			
-- Chemical-Hydrogen Systems (Ongoing)	o Continued to conduct experiments on stand-alone electrolyzer systems including the static feed water system which is capable of electrolyzing sea water directly. Conduct research on intermediate- (300-500°C) and high-temperature (1000°C) electrolysis for the production of hydrogen. ($650)	o Conduct long-range R&D addressing the use of hydrogen as a cost-effective energy carrier and storage medium for energy produced from solar and other inexhaustable resources. R&D will include studies of hydrogen production options such as high-temperature electrolysis of water vapor and dissociation of molecules by direct irradiation with concentrated sunlight. Investigate storage options such as refrigeration by adiabatic demagnetization, metal-assisted cold storage, and advanced metal hydride research to achieve lower cost in liquefying hydrogen for storage. ($995)	o Continue long-range R&D on the use of hydrogen as a cost-effective energy carrier and storage medium for energy produced from solar and other inexhaustable resources. Research will include: multicell modules in high-temperature electrolysis of water vapor; proton-conducting solid electrolytes in medium-temperature electrolysis and dissociation of water using polymeric-coated photoactive semiconductors. Investigate metal assisted cold storage and advanced metal hydrides to achieve lower cost in liquefying hydrogen for storage. ($1,000)

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
-- Thermal Energy Storage	o Continued to conduct research on form-stable phase-change materials in the medium-and high-temperature range. Explored advanced storage and conversion techniques and solid-state heat pumps. Conducted experiments on long-term storage cycles and analyze chill storage field tests. ($1,650)	o Perform research to develop a technology base for cost-effective thermal storage in building applications. Perform systems analysis and development of commercially viable fabrication process for composite salt-ceramic eutectic heat storage pellets. Perform research on fundamental properties of inclusion compounds (i.e., clathrates) for single- and dual-storage media. Investigate heat transport by phase-change materials and explore catalysis of reversible chemical processes on microparticles. Evaluate and analyze long-term storage of heat or chill in commercial applications. ($1,950)	o Explore innovative concepts of solid-state heat pumps, fluidized phase-change systems, investigate advanced containment techniques for high-temperature solar thermal storage; research on diurnal storage using phase-change slurry systems and clathrates for dual-temperature applications; continue studies on heat transfer using high-temperature composite latent heat storage materials, and on control of crystallization and nucleation in ice formation. ($500)

Key Activity	Actual Activities During FY 1985	Estimated Activities During FY 1986	Planned Activities During FY 1987
-- Capital Equipment	($0)	($0)	($0)
Subtotal - Thermal and Mechanical Energy Storage	($2,300)	($2,945)	($1,500)
Program Direction	o Provide for 6 FTE's. ($453)	o Provide for 6 FTE's. ($327)	o Provide for 6 FTE's. ($399)
Energy Storage			
TOTAL	$18,642	$15,378	$8,600

Chairman HATFIELD. The Senator from Georgia?

Senator MATTINGLY. Mr. Chairman, I have three questions I would like to submit for the record. I won't take the time to ask them, but I would appreciate it if Dr. Trivelpiece could provide a reply for the record.

Chairman HATFIELD. The Senator will have additional questions to submit to you for your response.

[The questions and answers follow:]

QUESTIONS SUBMITTED BY SENATOR MATTINGLY

Question: Dr. Trivelpiece: Does the Department still have plans to go forward with development of a university research center or centers for the study of complex carbohydrates. If so, could you please give us some sort of timetable? If not, why not?

Answer: We place high priority on increased support for the study of complex carbohydrates. However, in view of the President's initiative to reduce deficit spending, coupled with uncertainties resulting from the Gramm-Rudman-Hollings legislation, we are unable to develop any meaningful timetable for the establishment of these research centers at this time.

Question: Dr. Trivelpiece, would you be kind enough to tell us how the plan for the Atlanta University Center Science and Technology is progressing, and whether the Department is satisfied with the development of this program?

Answer: The Office of Energy Research provided $250,000 in FY 1985 to Atlanta University to support the preparation of the conceptual design for the proposed Graduate Center. This plan has been completed and submitted to us. The University has also proceeded with the development of a detailed architectural and engineering plan for the Center, and I am pleased to report that over two-thirds of this plan has now been completed. The overall design and plan for the building is well conceived and will give the University flexible laboratory and support space. Good progress has also been made by the University in seeking private funding for the new building and commitments have been received for over $5 million of private support. We believe that the new building will significantly expand the capabilities of Atlanta University faculty and students to make direct contributions to energy-related research and to basic science.

The FY 1986 Appropriation provided $4,500,000 for the construction of a Graduate Center for Science and Technology at the University. This amount was reduced to $4,300,000 in accordance with the Gramm-Rudman legislation. However, the Administration has proposed that these funds be rescinded as part of the overall effort to reduce the Federal deficit. The ultimate disposition of these funds will, therefore, await a decision by Congress.

Question: Madame Secretary, we are all aware of the urgent need to control federal spending and to reduce the deficit. However, in looking at the request for Solar Thermal Energy Systems and for Biofuel Energy Systems, it would appear that we are making some pretty drastic cuts which will threaten the future development of several promising technologies. The request of $15.3 million for Solar Thermal is only 45% of the 1985 level and the $12.2 million for Biofuels is 41% of 1985's spending. I am concerned that if we pull federal support from the basic and high-risk research and development of such technologies as the entrained pyrolysis thermochemical conversion process that we will substantially increase the time before we realize the full benefits of biofuels. I do think that we can obtain a greatly increased level of private and state support in these two areas.

But if we pull the plug in such an abrupt manner, we may well discourage rather than encourage such support. I understand that the Biofuels program would need to be funded at about $23.0 million and the Solar Thermal at around $21.0 million if we are not going to suffer adverse impacts in ongoing projects. Even those figures; however, reflect a reduction in funding from current levels. Would you share your thoughts with us a little more fully on this matter.

Answer: As I have stated before, deficit reduction is an economic imperative. The Department, recognizing this fact, has proposed a budget which focuses efforts on those technologies which have the greatest long term promise for contributing to the nation's energy supply mix. In both Solar Thermal and Biofuels, we have followed that philosophy.

ENERGY RESEARCH

STATEMENT OF DR. ALVIN W. TRIVELPIECE, DIRECTOR, OFFICE OF ENERGY RESEARCH, DEPARTMENT OF ENERGY

Chairman HATFIELD. I will now turn and invite Dr. Alvin W. Trivelpiece to testify. Dr. Trivelpiece is the Director of the Office of Energy Research.

Dr. Trivelpiece, we have your full statement here. If you would like to highlight it, we would be very happy to hear from you.

Dr. TRIVELPIECE. Thank you, Mr. Chairman.

I am here to discuss——

Chairman HATFIELD. I have the full statement. [Laughter.]

Dr. TRIVELPIECE. I understand.

Chairman HATFIELD. All 88 pages, and I really would urge you to highlight it. [Laughter.]

Dr. TRIVELPIECE. It would seem an appropriate depth for $1.8 billion in requests, so we try to match the length of the submission to the size of the budget.

BUDGET HIGHLIGHTS

That budget includes high energy and nuclear physics, which are part of the general sciences appropriation, and basic energy sciences, biological and environmental research, the Magnetic Fusion Program, and all other Office of Energy Research programs which are part of the energy supply appropriation.

I have appeared before this subcommittee quite a few times in the past to seek support by the committee for the administration's proposed budget. In my testimony, I have never made any secret of the fact that I am a strong advocate, in fact, I believe that these programs are essential elements in the Nation's science, technology, and educational enterprise. They have been strongly supported by the Congress and by the administration over the years, and so, even in this period of concern over deficit control, we are proposing to have a small increase in funding for all but one of them, and then some decrease in that program, which I will come to.

HIGH ENERGY PHYSICS

In the High Energy Physics Program, funding is requested to begin the operation of the Tevatron-I collider at Fermilab and the Stanford linear collider [SLC] facility at Stanford. The Tevatron-I facility operated and set a world record of 1.6 TeV collision energy. SLC will provide a copious supply of the Z-zero particles for which Carlo Rubbia won the Nobel prize a few years ago. We have been funding the

Superconducting Super Collider Feasibility Program for the last 3 years for about $20 million a year. There is no specific amount identified this year. This has caused some concern that there might be a change in the administration's position on this project.

That is not the case. Our position is this was and is an important project. Before proceeding, we need to know certain things; for instance: how much will it cost? Can it be built with comtemporary technology? Is it feasible? What are the site requirements, and so on.

We have this information at hand. We plan to make this information available to Secretary Herrington with some kind of a go-no go decision for a request for funding in the fiscal year 1988 budget. Depending on the Secretary's decision with regard to this project, we need to make some determination of exactly what activities would be needed in 1987 to be congruent with his decision.

This should all happen some time early this summer, and it would help us in preparing our fiscal year 1988 budget to keep you informed as we make progress in this activity.

NUCLEAR PHYSICS

In nuclear physics, the principal highlight is the construction start for the continuous electronic beam accelerator facility, affectionately known as CEBAF. This project has been about as thoroughly reviewed as any I have been involved with, and I know you are familiar with some of the details of this. I don't believe it is necessary to go over all the details at this time, other than to remind you that this project does have very high support of the nuclear physics community as a high-priority facility.

We have also made a decision to proceed with the R&D to define the characteristics of a so-called relativistic heavy ion collider at Brookhaven National Laboratory, but no commitment has been made with regard to construction of that activity. In the Basic Energy Sciences Program, funding is requested to maintain the continuation of core activities at about the same level of last year, and the principal highlight in this element of the budget involves the Department's proposal to initiate the construction of a 1'v2 GeV synchrotron light source at the Lawrence Berkeley Laboratory and a request to continue the R&D effort on a 6 GeV light source at the Argonne National Laboratory. These two projects would fill a critical need in the United States for such facilities identified in the Seitz-Eastman report to the National Academy of Sciences. That report was endorsed by the Energy Research Advisory Board.

I realize this is a difficult year to be proposing new project starts, but the current deficit budget problem shouldn't blind us to the long-term needs for facilities that will be required to keep the United States at the forefront in some of these important areas of basic research.

The Biological and Environmental Research Program is funded at a level that keeps pace with inflation, and there are no particular budgetary highlights on this program.

FUSION ENERGY PROGRAM

With regard to the fusion program, I am frequently asked, "When will we have fusion energy?" The answer always seems to be, "In about 20 years." It is sometimes even joked about as being a fundamental constant of the program, with the implication that no progress is being made. I want to take this occasion to comment on this question.

That is, what question really was being asked 25 years ago? It wasn't when would we have a fusion-driven electric powerplant? Rather, it was really: Could we create, confine, and heat a plasma to the right conditions for fusion to occur. The answer to that question is, yes, we can. We can design, construct, and operate the magnetic fusion plasma confinement system that will create the conditions for sustained fusion reactions. The original question of 25 years ago has been answered in the affirmative.

However, in the meantime, the implication of this question has shifted from that of scientific feasibility to one of technological feasibility. That is, now that we can produce the right kind of plasma, how long will it take to develop a practical energy source and that, indeed, could take another 20 years. This, of course, depends on what priority the United States and other countries might give to the development of fusion energy.

It is somewhat ironic that despite all of the hard work of scientists here and around the world to get us to this point, we find ourselves in the midst of an energy supply surplus which has reduced the determination to pursue alternate energy options with the same vigor that we did in the seventies. This situation, combined with the budget deficit pressures as a result of the administration request for fiscal year 1987, results in magnetic fusion being funded in fiscal year 1987 at about $50 million less than the fiscal year 1986 conference level.

This reduction, following the reductions of the preceeding 2 years, has left me with a very difficult problem. That was, we could not digest this kind of a cut and address all confinement approaches that might be desirable. As a result, we had to eliminate the Magnetic Mirror Program activities. This is not because there is any particular technical problems with that approach or that scientists or engineers working in that program have not performed in a satisfactory manner. It is quite the contrary. I believe they have done a rather superb job in the design and construction of the MFTF–B facility at Livermore.

It is, indeed, unfortunate that the budgetary pressures dictate that we not operate this splendid facility which has just been completed. To commemorate the construction of the MFTF–B, a small ceremony was recently held at the Lawrence Livermore Laboratory. At that ceremony, a letter was presented from Secretary Herrington to Dr. Fowler, Associate Director for Fusion at that laboratory. This letter really summarized the situation very well. I would like to read one paragraph of it and have the full letter submitted for the record.

Secretary Herrington says, in his closing paragraph:

I hope that the circumstances will change in such a way that this facility can eventually be operated to gain the knowledge that it was designed to generate. In the meantime, I know that you will continue to make important contributions to the Nation's effort to make fusion energy a practical reality. I am grateful that you have the skills and dedication to do this important work. You have my admiration for what you have done and what you will do.

Signed, John Herrington.

[The letter follows:]

FEBRUARY 18, 1986.

Dr. T. KENNETH FOWLER,
Associate Director, Magnetic Fusion Energy Program,
Lawrence Livermore National Laboratory,
Livermore, CA.

DEAR DR. FOWLER: First, I want to extend my congratulations to you and your staff for a job well done in the design and construction of the Mirror Fusion Test Facility. The hard work, dedication, and hopes that go into this kind of effort are among the characteristics that make this country great.

Second, I want all of you to know how much I regret the fact that just as you complete this remarkable new facility, the budget pressures dictate that we must put it into standby and not operate it as you might have hoped. This is frustrating and perhaps not the best use of our national talent and resources, but we must bring the deficit under control. Those of you who are affected by this must feel that this is unfair and that the budget reductions should have been applied elsewhere. Perhaps, but budget reductions were applied elsewhere, and I have tried to see to it that this was done in a fair and equitable manner consistent with the President's goals.

I hope that the circumstances will change in such a way that this facility can eventually be operated to gain the knowledge it was designed to generate. In the meantime, I know that you will continue to make important contributions to the Nation's effort to make fusion energy a practical reality. I am grateful that you have the skills and dedication to do this important work. You have my admiration for what you have done and will do.

Yours truly,

JOHN S. HERRINGTON.

EDUCATIONAL INVESTMENT IN THE FUTURE

Dr. TRIVELPIECE. As a final note, Mr. Chairman, I want to also mention the fact that the other day, I had the good fortune to meet a young lady at the Westinghouse Science Talent Search Awards ceremony. This is a search that the Westinghouse Corp. puts on for high school students. This lady was a third place winner. Through competition, she won $15,000 for her efforts. Her name is Yoriko Saito. The reason I mention it is, this is not the first time I had the good fortune to meet her. The previous time was at a graduation ceremony for the first class of the DOE Super Computing High School Honors Program at the Magnetic Fusion Center at Livermore.

This new program by the Department was stimulated by Secretary Herrington, who last year, at about this time, asked me what we might do to involve our laboratories with high school students that might stimulate their interest and curiosity in science and technology. I got back to him a few days later and said some things I thought we might do about a year from now, and somewhat impatiently, he said he meant right now, so I decided to get on with it right now, and proceeded to propose to invite the best student in math and science from each of the States and one from the District of Columbia and one from Puerto

Rico to go out to Livermore and work on the Cray supercomputer for 2 weeks. Now, this program worked very well, fortunately, for me, and this is in spite of having to explain the benefits of this program to the lab Director, Dr. Batzel. He wasn't thrilled about the idea initially of having 52 high school kids running around Livermore with access to their super computers. I notice they changed all the passwords after the kids left. [Laughter.]

That was an important ingredient.

We plan to expand this program a little bit next year and, in fact, have 50 kids go back to Livermore, as well as 50 go up to Brookhaven National Laboratory to work on the synchrotron light source.

I believe this activity of using DOE's laboratories to help stimulate our bright students to pursue careers in science and technology is extremely important. It is not costly, and based on the conversations that I had with the students at Livermore last summer, it is the right way to incite their interest.

One of the parents wrote to me and she said that when her daughter returned home and greeted her, she said that, "Mom, this is the most important 2 weeks of my life."

Mr. Chairman, I think that sort of says it all, and I would be happy to answer any questions.

[The statement follows:]

STATEMENT OF ALVIN W. TRIVELPIECE

Mr. Chairman and Members of the Subcommittee:

It is a pleasure to appear here today to present the FY 1987 budget request for the programs supported by the Office of Energy Research (ER). These programs include: High Energy and Nuclear Physics, Basic Energy Sciences, Magnetic Fusion Energy, Biological and Environmental Research, Energy Research Analysis, University Research Support, University Research Intrumentation, and Multiprogram Energy Laboratories-Facilities Support. The High Energy and Nuclear Physics programs are under the General Science and Research appropriation. All of the other programs are under the Energy Supply R&D appropriation. The FY 1987 budget request for all ER programs is shown in Table 1.

At this point I would like to discuss each of the programs mentioned above in some detail.

HIGH ENERGY AND NUCLEAR PHYSICS

The High Energy and Nuclear Physics programs seek the answers to questions that man has asked for many hundreds of years, namely, what are the basic constituents of matter and what forces govern them. While conducting this research, the High Energy and Nuclear Physics programs, over the years, have made significant contributions not only to energy resource development, but to

Table 1
Office of Energy Research
Summary by Program
($ in millions)
Budget Authority

	FY 1985	FY 1986		FY 1987
	Conf. Approp.	Conf. Approp.	Adjusted	Request
General Science & Research				
High Energy Physics	$541.9	$517.1	$494.8	$546.7
Nuclear Physics	181.5	171.9	164.5	224.2
General Science Program Direction	2.2	2.4	2.1	2.5
Transfer of Appropriation	0	- 6.0	- 6.0	0
Subtotal	$725.6	$685.4	$655.4	$773.4
Energy Supply - R&D				
Basic Energy Sciences	$410.8	$450.8	$433.8	$441.4
Magnetic Fusion Energy	429.6	379.8	365.5	333.0
Biological & Environmental Research	187.7	187.0	179.9	196.6
Energy Research Analysis	3.0	2.7	2.6	3.5
University Research Support	10.1	10.7	10.3	11.0
University Research Instrumentation	4.9	6.5	6.2	5.0
Multiprogram Energy Laboratories-Facilities Support	33.2	42.1	39.8	60.2
Advisory & Oversight Program Direction	2.9	2.8	2.7	2.9
Policy and Management	0.5	0.1	0.1	0.5
Subtotal	$1,082.7	$1,082.5	$1,040.9	$1,054.1
Total ER	$1,808.3	$1,767.9	$1,696.3	$1,827.5

education, health, industry and national defense. Contributions to the economic growth and prosperity of the Nation have come directly from the results of the research, from technological spinoffs and from the training of tomorrow's scientists through participation of university graduate students in the research. Through science and technology transfer, these ideas and people have made contributions in a variety of industries including medical instrumentation and therapy, control and instrumentation of industrial processes, the production of nuclear energy, and many applications of electronic and computer techniques.

The High Energy and Nuclear Physics programs are closely related not only in terms of overall goals, but also in the types of facilities and equipment used to reach these goals and the impact that research in one program has on the other. Both seek to contribute to an understanding of the basic constituents of matter and the forces that govern them. Nuclear Physics does so by studying the nucleus; High Energy Physics does so by studying the most fundamental of particles that comprise the nucleus and all other matter.

Experiments in both the High Energy and Nuclear Physics programs depend on large experimental facilities that accelerate beams of particles to collide with stationary targets or head-on with other moving particle beams. Studying the results of these collisions helps scientists to learn about the properties of the underlying building blocks and basic forces involved. Although research progress depends on the availability of these forefront accelerator and colliding beam facilities, as well as on the detectors that record the results of the collisions, progress also depends on a continuing interplay of advancements in experiment, theory and technology. Often the range of experiments possible is determined by available technology; and physicists frequently have to invent new equipment and technology to carry out the most important experiments.

In the High Energy Physics program, research utilizing accelerators is conducted principally at four accelerator laboratories in the U.S., two in Europe and one in Japan and encompasses more than 150 user groups. The Nuclear Physics program, carried out at seven national facilities, accommodates approximately 70 user groups. The program also utilizes facilities in Canada and Europe.

HIGH ENERGY PHYSICS

Progress toward improving our understanding of the fundamental nature of energy and matter and their most elemental transformations has come rapidly in recent years. In developing this knowledge, five U.S.-supported high energy physicists have won or shared in Nobel prizes during the last seven years. The major current objective of high energy physics research is unification of the basic forces into a single theoretical framework; in other words, a single theory that would describe all of the interactions of matter and energy existing in the universe.

The electromagnetic force describes how atoms and molecules are formed and is the cornerstone to understanding chemistry, electronic communications and biological processes. The weak nuclear force describes processes such as the radioactive decay of nuclei. The strong nuclear force helps describe how the sun and the stars produce so much energy and holds the nucleus together. Together with the weak nuclear force, it also describes the relative abundance of the chemical elements. The gravitational force, perhaps the most familiar of the forces of nature, explains such things as how objects fall and planets move in their orbits.

Results of high energy physics research have led to an increasingly better understanding of the forces of nature and the unifying connections among them. A part of the recent progress in high energy physics has been the conceptual unification of the weak nuclear and electromagnetic forces into a single "electroweak" framework. In addition, a theory of the strong interaction force has emerged which is consistent with observation. There is increasing anticipation that the unification of the strong nuclear and electroweak forces into one "grand unified" framework may be possible, thus reducing the apparent number of forces in nature to two. The ultimate goal is a "super-grand" unification that would bring all of the forces in nature into a single unified framework. (An example of such a theory, called "superstrings," has recently attracted much attention.)

The picture of nature provided in terms of the electroweak and strong forces and the quark and lepton constituents is known as the Standard Model. The most significant recent experimental results all reinforce the predictions of the Standard Model. Experiments are in preparation to use the new capabilities coming into operation in early FY 1987 and the near future to search for phenomena which do not conform to the Standard Model and in particular for phenomena predicted by grand unified theories.

Before I discuss the budget request, I would like to report on some of the recent accomplishments in the High Energy Physics program. The Fermi National Accelerator Laboratory (Fermilab) Tevatron, the world's first high energy accelerator using superconducting magnets, provided beam for numerous experiments with protons at energies up to 800 billion electron volts (GeV) in 1984 and 1985. The substantial quantity of data recorded in the very productive 1985 run is now being analyzed. The new antiproton source produced a high energy antiproton beam in the Summer of 1985. The first proton-antiproton collisions at 1600 GeV (800 GeV on 800 GeV) were observed with the Collider Detector at Fermilab (CDF) in a test run in the Tevatron colliding beam mode. In FY 1987 the accelerator is expected to operate at energies near 900 GeV per beam for both fixed target and colliding beam experiments.

The Alternating Gradient Synchrotron at Brookhaven National Laboratory (BNL) has the world's highest energy beam of polarized protons and high intensity kaon beams for precision studies of rare kaon decays.

Successful development of the Stanford Linear Collider (SLC) at the Stanford Linear Accelerator Center (SLAC) will provide an essential demonstration of the technical feasibility of the new linear collider concept, which is a critical step toward future cost-effective extensions of electron-positron reaction energies beyond the maximum energy practical with circular accelerators. It will also permit significant new physics with 50 GeV on 50 GeV electron-positron colliding beams. Good progress is being made on fabrication and installation of components for SLC. Systems tests are scheduled to begin later in FY 1986, and first 50 GeV on 50 GeV colliding beam experiments are planned early in 1987.

FY 1987 HIGH ENERGY PHYSICS BUDGET REQUEST

The FY 1987 request for the High Energy Physics program is $546.7 million, which consists of $427.5 million for Operating Expenses, $77.5 million for Capital Equipment and $41.7 million for Construction (Table 2).

A major part of the funding for the program is required to meet the direct needs of the accelerator laboratories to develop, maintain and operate the major accelerator, colliding beam and detector facilities. The high energy particle accelerator and colliding beam facilities to be operated by the Department in FY 1987 include: first operation for research of Fermilab's collider and CDF providing 900 GeV on 900 GeV proton-antiproton collisions; the first operation for research of the SLC collider and Mark II detector at the Stanford Linear Accelerator Center (SLAC) providing 50 GeV on 50 GeV electron- positron collisions; the Tevatron superconducting magnet proton synchrotron at Fermilab providing proton beams of about 800 GeV and numerous secondary beams for fixed target experiments; the 50 GeV linear electron accelerator at SLAC providing injected beams for the PEP storage ring (15 GeV on 15 GeV) and for the SPEAR storage ring (4 GeV on 4 GeV) in addition to the SLC mentioned above; and the 30 GeV proton synchrotron, the Alternating Gradient Synchrotron (AGS), at Brookhaven National Laboratory (BNL). Each of these DOE accelerator centers provides a unique set of experimental research capabilities, complementary to the others.

Table 2
High Energy Physics
Budget Authority
($ in millions)

	FY 1985	FY 1986		FY 1987
	Conf. Approp.	Conf. Approp.	Adjusted	Request
Operating Expenses				
Physics Research	$106.3	$111.0	$106.3	$118.6
Facility Operations	172.7	183.1	175.1	213.4
High Energy Technology	90.2	92.4	88.4	95.5
Subtotal	$369.2	$386.5	$369.8	$427.5
Capital Equipment	58.7	73.1	70.0	77.5
Construction	114.0	57.5	55.0	41.7
Total High Energy Physics	$541.9	$517.1	$494.8	$546.7

The facilities at these laboratories provide the source of experimental data for most of the High Energy Physics research, more than 75% of which is carried out by university-based scientists. In addition to research carried out using high energy accelerators in the U.S., the Department's High Energy Physics program supports experiments which use the capabilities of unique foreign accelerators and also some experiments which do not require beams from particle accelerators.

The FY 1987 request for operating expenses is $427.5 million. The major features of the program in FY 1987 will be the first operation for research of the 900 GeV on 900 GeV proton-antiproton colliding beam capability provided by Tevatron I, and of the 50 GeV on 50 GeV electron-positron colliding beam capability provided by the SLC. The program will also include operation and research utilization of the recently upgraded Tevatron fixed target facilities at Fermilab, of the BNL AGS with its fixed target program including rare kaon decay experiments and its unique high energy polarized proton beam, and of the SLAC PEP and SPEAR colliding beam facilities. There are major incremental costs associated with operation of the new world forefront Tevatron and SLC collider facilities. These two new research capabilities ensure a world competitive position for the U.S. program. The request brings these new research facilities into operation and accommodates an overall facility utilization level near 50 percent. The request provides continuing support for university-based groups including U.S. user group efforts at U.S. and foreign accelerators, non-accelerator experiments, and theoretical research efforts. The FY 1987 program also includes funding for a continuation of advanced technology accelerator and detector R&D. I will make some specific remarks about the Superconducting Super Collider (SSC) after I have completed summarizing the High Energy Physics budget.

The FY 1987 capital equipment request of $77.5 million meets the highest priority needs for the detectors required to implement strong research programs based upon the new capabilities provided by the Tevatron proton-antiproton collider at Fermilab and by the SLC electron-positron collider at SLAC. The equipment request for FY 1987 is essential to make it possible for the D-Zero and Stanford Linear detectors to be completed in FY 1989 and thereby permit most effective utilization of the new U.S. High Energy

Physics facilities being completed in FY 1986 at Fermilab and SLAC.

The FY 1987 request for construction funds is $41.7 million. The projects are listed in Table 3. This program includes continued work on upgrading of the central computing capability at Fermilab ($14.1 million) which is required for the analysis of the large volume of new physics data coming from the Tevatron program, to continue construction of the AGS Accumulator/Booster at BNL ($3.5 million) and to complete construction of the SLC ($1.0 million) and Tevatron I ($0.4 million).

Table 3
High Energy Physics
Budget Authority
($ in millions)

	FY 1987 Request	TEC	Completion Date
Construction			
Tevatron I (81-E-218)	$ 0.4	$ 84.0	FY 1987
Stanford Linear Collider (84-ER-133)	1.0	115.4	FY 1987
Central Computing Upgrade, Fermilab (86-R-104)	14.1	24.1	FY 1988
AGS Accumulator/Booster, BNL (86-R-105)	3.5	26.4	FY 1989
Accelerator Improvements and Modifications Project (87-R-101)	11.5	11.5	FY 1989
General Plant Projects (87-R-102)	11.2	11.2	FY 1989
Total Construction	$ 41.7		

Funds are requested for Accelerator Improvement and Modifications Projects ($11.5 million) that are critical on an annual basis to maintain the scientific effectiveness and the operating reliability and efficiency of the accelerator and colliding beam facilities. The request also provides $11.2 million for General Plant Projects (GPP) which are required to keep the general plant of the laboratories (e.g., buildings, roads, utilities) in operating condition.

This brings me to the SSC, which has been the subject of great interest, both in the scientific realm and in the public realm. I would like to state briefly where we are now and what the Department's plans are with regard to the SSC.

As I indicated in my discussion of accomplishments, excellent progress has been achieved in recent years in improved understanding of the fundamental constituents of matter and the basic forces that influence their behavior. Physicists now have the "Standard Model" which provides a framework within which these things can be viewed consistently. However, the Standard Model is not the final anwer. Many very fundamental questions such as the origin of particle masses cannot be answered within the theory. There is much left to do.

The facility upgrades nearing completion at Fermilab and SLAC will provide two world forefront research capabilities to the beginning of the 1990's which will permit exploration in new physical domains and exciting new discoveries. However, these research capabilities cannot explore the TeV mass scale where breakthroughs in fundamental understanding and new phenomena are expected. Access to the TeV mass scale will definitely test many key features of the Standard Model, and permit exploration of an entirely new domain never before explored.

In late 1983, the Department developed a plan to initiate preliminary R&D related to an SSC. This R&D program was to carefully assess costs, examine cost-reduction opportunities, and resolve technical and design issues, providing crucial input upon which to base an informed judgment about proceeding with the SSC at an appropriate time. The activities begun in FY 1984 have been continued into FY 1985 and FY 1986.

The accelerator R&D related to the SSC initiated in FY 1984 was achieved as a redirection of efforts from earlier planned accelerator R&D. The 1984 work included R&D on technical options (particularly with regard to superconducting magnets), cost reduction studies, and a Reference Designs Study (RDS) which established technical feasibility and developed credible preliminary cost and schedule estimates. Research and development activities in FY 1985 included R&D to confirm RDS assumptions; cost reduction studies; further R&D on superconducting magnet designs to provide the technical basis for selection, near the end of that fiscal year, of the magnet type which would yield the best performance at the lowest facility cost; studies to develop a cost performance optimized design; and development of a technical site criteria report. The technical progress of the R&D activities has been excellent. Critical milestones have been met. In FY 1986, SSC-related research and development includes advanced accelerator R&D to develop a cost/performance optimized design for the selected type of superconducting magnet, to develop cost-effective techniques for fabrication of full length superconducting magnets, and to develop conceptual systems designs. This program will provide the technical information for an indepth Departmental review of the SSC this Summer. Although a continuing R&D program is required in FY 1987, the direction and emphasis of the program, especially the work on superconducting accelerator magnets and associated systems, will depend on the results of this review.

NUCLEAR PHYSICS

The Nuclear Physics program supports the basic research necessary to identify and understand the fundamental features of atomic nuclei and their interactions. Nuclear processes have guided the evolution of the universe, fueled solar burning, and determined the interplay of the primary forces of nature -- the strong nuclear force, the electromagnetic force, and the weak force. The study of nuclear physics consequently lies at the core of fundamental scientific research.

In terms of trained manpower, new knowledge, and advanced instrumentation, the Nuclear Physics program continues to be a vital factor in America's long-term investment in its technological future. Nuclear knowledge, techniques, instruments, and applications are an integral part of American society. These serve as the basis for our national defense strategy, for therapeutic and diagnostic medical applications, for generation of electricity with nuclear reactors (fission now and fusion in the future), and for a large and diverse array of applications in industry.

The role of mesons as nuclear constituents and their utility as nuclear probes continues to be an important component of nuclear physics research, but new theoretical insights have opened the door to a more profound level of understanding. Neutrons and protons are now known to be composed of quarks and gluons, and mesons are now known to be composed of quark-antiquark pairs. Nuclear theorists, along with high energy theorists, are investigating the ways in which quarks are confined together in "bags" of three to make up neutrons and protons. A more fundamental theory of the nuclear force is emerging based on the quantum chromodynamics (QCD) model of quarks and gluons. This new theory alters in ever expanding ways the concepts and phenomena of nuclear physics. Exploring these new concepts requires higher energies than have been available to the Nuclear Physics program up to now.

Before turning to the budget request, let me summarize several Nuclear Physics accomplishments achieved during the last year.

The best quantitative measurements for testing the theory that protons and neutrons are made up of quarks come from precision scattering experiments carried out with various high energy beams of electrons and muons. Results of these precision scattering experiments have given detailed information about the quarks and their motion inside the proton and neutron. Recently, the European Muon Collaboration (EMC) at CERN used muon beams to bombard nuclei spanning the periodic table from hydrogen to uranium. Researchers observed that the high energy muons scattered differently from the quarks bound inside nuclei than from the quarks in free protons and neutrons. This unexpected observation, called the EMC effect, has been verified and extended by research at the Nuclear Physics facility at the Stanford Linear Accelerator Center. A variety of theoretical models has been proposed to explain the EMC effect. These include (1) an increased size of the three-quark bag (nucleon) within the nucleus; (2) the existence of six-quark bags within the nucleus; (3) enhancement of the number of pions within the nucleus; and (4) conventional nuclear structure effects from momentum and binding energy distributions. Since each of these theoretical models can explain the existing electron and muon data, it is important to test with further experiments the differences identified in the various models. An experiment using the polarized proton beams at the Los Alamos Meson Physics Facility (LAMPF) now appears to rule out the contributions of increased pion density. A detailed investigation at the Massachusetts Institute of Technology (MIT) Beta Laboratory suggests that interactions between quark motion and bulk nuclear matter correlations may be more important than previously realized leading to enhanced understanding of lower energy phenomena.

In collaboration with experimental groups from the Laboratory for Heavy Ion Research at Darmstadt, West Germany (GSI), and the Universities of Frankfurt and Heidelberg, scientists from Yale have discovered narrow peaks in the spectrum of positron emissions from collisions involving supercritical Coulomb fields. Such fields can occur during the collision of heavy ion projectiles and targets consisting of various combinations of heavy elements.

Early experiments indicated that spontaneous ionization of the vacuum was responsible for the production of electron-positron pairs. However, this source of the positrons is being discounted because the position of the peak does not move as predicted with changes of projectile and target species. A second suggestion that the peaks arise from the decay of long-lived super-heavy element formation is also losing favor. Recently, it has been suggested that the peaks could result from the decay of one or more previously unknown light elementary bosons created in the heavy ion collision. Alternative possibilities are that the peaks arise from the decay of a three electron complex consisting of two positrons and one electron or from tidal effects of the atomic electron cloud. Ion source improvements at Argonne National Laboratory (ANL) are being implemented in order to investigate this phenomenon with coincidence experiments between the positrons and possible electron partners.

Recent progress at Lawrence Berkeley Laboratory's (LBL) Bevalac includes the first experimental determination of the compressibility of hot nuclear matter by studying the emission of pions from colliding nuclear systems. LBL scientists also made the first measurement of hydrodynamical flow effects in heavy ion collisions. Recent experiments have used the Plastic Ball detector to detect and measure over one hundred particles simultaneously emitted when nuclei accelerated to high energy collide with nuclei stationary in the laboratory. These programs mark the beginning of quantitative studies to determine the equation of state of hot, dense nuclear matter. Knowledge of the nuclear equation of state, in particular the compressibility of nuclear matter, determines our ability to understand collapsing stars as they consume all of their nuclear fuel. Astrophysical calculations require that nuclei have a "soft" equation of state (very easily compressed) in order to bounce back from a gravitationally driven implosion, creating a shock wave that may lead to a supernova explosion. Results from high energy heavy ion collisions, however, indicate that nuclear matter is very "hard." This disparity leads to a distinct, unresolved scientific dilemma.

Recently, the elastic scattering of electron-type neutrinos from electrons was measured for the first time by scientists using the beam stop at LAMPF as an intense source of electron-type neutrinos. In about six months of data taking, over 30 billion neutrinos passed through the detection apparatus in order to produce 51 scattering events. Three distinct possible results were permitted by various theoretical models prior to this result, but only one is consistent with the observation. The experiment is continuing, and with the expected level of statistics, further definitive statements about characteristics of the electroweak interaction will be made.

The FY 1987 Nuclear Physics experimental program will continue its emphasis on the fundamental properties of nuclear matter and on the experimental investigation of the behavior of quarks inside nuclei and of the way in which quarks determine the characteristics of nuclei. In nuclear theory, emphasis in FY 1987 will be on understanding the limitations of the present quantum chromodynamics theories as exact theories of the nuclear force, on improving these theories, and on understanding the ways in which new quark configurations would become evident.

FY 1987 NUCLEAR PHYSICS BUDGET REQUEST

The FY 1987 budget request for the Nuclear Physics program is $224.2 million. Of that amount, $174.9 million is for Operating Expenses; $16.0 million is for Capital Equipment; and $33.3 million is for Construction (Table 4). The FY 1987 request includes $25.0 million for initiation of construction plus $6.25 million in operating expense funds for supporting research and development of the Continuous Electron Beam Accelerator Facility

(CEBAF). CEBAF has the highest priority for new construction in basic nuclear research in the United States.

CEBAF will be a new, single-purpose facility for basic nuclear research. Its combination of continuous beam, high intensity, and high energy will be unique in the world and will be important to maintain America's position of worldwide leadership in basic nuclear research. It will be operated as a user facility serving a nationwide and international community of nuclear scientists. The central instrument of CEBAF will be a high intensity, high duty factor electron accelerator with an energy range of 0.5-4.0 billion electron volts (GeV). The construction project includes an initial complement of experimental equipment and support facilities necessary to perform scientific experiments using CEBAF's high quality electron and photon beams.

Table 4
Nuclear Physics
Budget Authority
($ in millions)

	FY 1985	FY 1986		FY 1987
	Conf. Approp.	Conf. Approp.	Adjusted	Request
Operating Expenses				
Medium Energy Nuclear Physics	$ 73.9	$ 76.5	$ 73.1	$ 85.0
Heavy Ion Nuclear Physics	49.0	52.4	50.2	63.7
Low Energy Nuclear Physics	13.3	12.6	12.1	15.7
Nuclear Theory	9.3	9.4	9.0	10.5
Subtotal	$145.5	$150.9	$144.4	$174.9
Capital Equipment	12.7	14.0	13.4	16.0
Construction	23.3	7.0	6.7	33.3
Total Nuclear Physics	$181.5	$171.9	$164.5	$224.2

Upon completion of construction, scientists can investigate the ways in which the quarks bound in neutrons and protons influence the makeup and behavior of nuclei, to determine how quarks interact while embedded within nuclear matter, and to test quantum chromodynamics as the fundamental theory of the strong nuclear force. Experiments in which electrons knock protons or neutrons out of nuclei will yield information about how energy and momentum is distributed among the nucleons bound inside nuclei and will tell us about correlations among nucleons in nuclei. At the high energy limit of electron scattering, experiments are, to a good approximation, only sensitive to effects of electrons scattering from individual quarks within the nuclei. Under these circumstances, nuclei can be described as a loose collection of free quarks. At energies below 1 GeV, electron scattering from nuclei can be described accurately as electrons scattering from the protons, neutrons, and mesons known to be in nuclei. The energy capability of CEBAF would permit quantitative examination of the transition between these complementary descriptions of nuclei.

As is the case with High Energy Physics, the Nuclear Physics program depends upon the operation of large and complicated accelerator facilities to provide the variety of projectile beams and energies required to conduct the nuclear research program. Of the Operating Expenses request, $93.3 million is needed for operation of these facilities. In FY 1986, the national facilities are expected to achieve an overall utilization rate of 55 percent. These National facilities are: the Clinton P. Anderson Meson Physics Facility at Los Alamos National Laboratory (LANL); the Bates Linear Accelerator Center at MIT; the SuperHILAC/Bevalac at LBL); the Argonne Tandem/Linac Accelerator System (ATLAS); the Holifield Heavy Ion Research Facility at Oak Ridge National Laboratory (ORNL); the 88-inch Cyclotron at LBL; and the Double MP Tandem/AGS facility at Brookhaven National Laboratory (BNL). To complement these National facilities, the Nuclear Physics program also supports on-campus accelerators at Yale, Duke, the University of Washington, and Texas A&M, each of which is being upgraded to maintain its effectiveness.

The FY 1987 Nuclear Physics budget request includes funds for initial heavy ion nuclear research and 1000 hours of accelerator operations at the Alternating Gradient Synchrotron (AGS) at BNL. Upon completion in FY 1986, the Tandem/AGS Heavy Ion Transfer Line will provide heavy ion beams to the AGS for acceleration to the unique energies of 14 GeV per mass unit. This unique capability offers the possibility that scientists may be able to create exotic new conditions of nuclear matter at high temperatures and densities.

The Capital Equipment request of $16.0 million would provide for particle detection systems, data acquisition and analysis systems, and instrumentation to improve the performance of Nuclear Physics accelerators. These funds are essential for the effective operation and utilization of the National accelerator facilities by the Nuclear Physics program.

Of the total request, $14.8 million is required for projects at BNL, LBL, ORNL, ANL, LAMPF, Bates Linear Accelerator Center at MIT, Oak Ridge Associated Universities, and Duke University. The Nuclear Physics program has landlord responsibility for providing the general purpose equipment at LBL, and $1.2 million is requested for that purpose.

The FY 1987 Construction request of $33.3 million (Table 5) includes the Continuous Electron Beam Accelerator Facility ($25.0 million), the Accelerator Improvements and Modifications Projects ($4.3 million), and the General Plant Projects ($4.0 million). These projects are needed to maintain the scientific effectiveness, reliability and efficiency of Nuclear Physics facilities.

GENERAL SCIENCE PROGRAM DIRECTION

The FY 1987 budget request for General Science Program Direction is $2.5 million. These funds are required to provide for the salaries, benefits, travel and other expenses associated with 39 full-time equivalents in the Office of the Associate Director for High Energy and Nuclear Physics and associated support staff required to administer these programs.

Table 5
Nuclear Physics
Budget Authority
($ in millions)

	FY 1987 Request	TEC	Completion Date
Construction			
Continuous Electron Beam Accelerator Facility (87-R-203)	$ 25.0	$236.0	FY 1992
Accelerator Improvements and Modifications Projects (87-R-201)	4.3	4.3	FY 1989
General Plant Projects (87-R-202)	4.0	4.0	FY 1989
Total Construction	$33.3		

Now let me turn to the Basic Energy Sciences program.

BASIC ENERGY SCIENCES

The goal of the Basic Energy Sciences (BES) program is to uncover the basic scientific and engineering knowledge that can be used by the Government and the private sector to develop new concepts, products, materials and processes. Although the principal focus of the BES program is aimed at underpinning the Department's energy and defense goals, a number of other important National goals are also supported. The U.S. leadership in science and technology, the stimulation of economic growth, and the training of tomorrow's scientists are additional goals to which BES contributes as a result of the support of basic research. While contributions from basic research cannot always be identified immediately or directly, the knowledge that flows from this research forms the current foundation on which new ideas and concepts grow in each of these areas.

The BES program annually supports approximately 1200 individual research projects in the physical, biological and mathematical sciences. These projects are selected on the basis of scientific excellence, relevance to BES' support of DOE long-term goals, and their contribution toward a balanced research program. This research is carried out largely by scientists at universities and National laboratories across the country.

Important results of supporting university researchers are the knowledge and technology transfer that occur when graduate students enter the private sector after completing their studies. In addition to research at universities and DOE laboratories, to a lesser extent, BES also supports research in industry and maintains contact there through a variety of mechanisms. These include participation in workshops, peer review panels, and the use by industry of the specialized research facilities supported by BES.

BES research covers the following seven areas: materials sciences; chemical sciences; nuclear sciences; mathematical sciences; engineering and geosciences; biological sciences; and advanced energy projects. The ultimate impact of the research results from over 1200 projects will be far reaching, beyond what is immediately obvious.

The following six examples, three of which I will discuss at some length and three that I will summarize in a sentence or two, provide some insight into the scope and diversity of the BES program.

The examples I want to discuss at length are in the Materials Sciences, Chemical Sciences, and the Advanced Energy Projects subprograms.

MATERIALS SCIENCES ACCOMPLISHMENT

In the Materials Sciences subprogram, very promising research is being supported on superconducting materials--materials that conduct electricity (electrons) without any loss of electrical energy. Normally, these materials are compounds of metallic elements and become superconducting only at low temperatures. Materials which carry electrical current are very important in view of the numerous crucial applications involving the transmission of electrons; electric current examples including cables that carry electrical power, wires that conduct current in motors and generators, and electrical conductors in devices that produce magnetic fields, such as for medicine for visualizing pathological problems in the human body. Most of the materials used for these applications currently are metals such as copper. However, recently much progress has been made in the discovery and understanding of electrically conducting organic materials. Organic materials made of non-metallic elements like carbon, hydrogen, sulfur, etc., have the potential of being cheaper, better, and lighter and could improve the operational characteristics of devices or energy systems.

During the past year, an exciting development occurred in the design, synthesis, and characterization of a new organic superconductor. The achievement was the result of a collaborative effort among researchers at Argonne National Laboratory, Sandia National Laboratories, and Strem Chemical Company. The achievement was the discovery of the highest ambient pressure superconducting transition temperature (5° above absolute zero) yet observed for a synthetic organic superconductor.

CHEMICAL SCIENCES ACCOMPLISHMENTS

In the Chemical Sciences subprogram, promising research is being conducted in solar photochemical energy conversion. Sunlight is used by plants in taking carbon dioxide from the air and water and converting it into food and combustible materials. Chemical scientists are working to understand this process which is at the same time the most common and the most complex of the processes which occur in the environment around us.

First, plant photosynthesis itself is the subject of intense investigation. Major advances have recently been made in understanding how sunlight makes the initial separation of electrical charges occur in the plant's "reaction center." This insight is being used to design simple molecules which can absorb light and use its energy to drive useful chemical reactions. A triad of molecules recently prepared at Argonne National Laboratory sets a new record for photoinduced charge separation, 2.4 millionths of a second. Though exceedingly brief by human standards, this is a long time by molecular standards. It involves two successive electron transfers in the same molecule.

Photochemists are also exploring photoinduced, thermodynamically unfavorable fuel-forming reactions at coated semiconductor electrodes and on surfaces of very small catalyst-covered semiconductor particles. While all of these systems are still in their infancy, there is every likelihood that at least one will become fundamental in future solar-related technology.

ADVANCED ENERGY PROJECTS ACCOMPLISHMENTS

A major recent accomplishment has been the development at the Princeton Plasma Physics Laboratory of a laboratory-scale x-ray laser, generating an extremely narrow beam of coherent ("marching in tune") x-rays. The importance of developing a laboratory-size x-ray laser cannot be overstated. It opens up new vistas in a number of applications, including the possibility of three-dimensional holographic imaging of live sub-microscopic objects. This, and other implications of short wavelength lasers for medical and other uses--for example in microlithography--make such lasers of keen practical importance. This accomplishment, listed recently by Science News Digest as one of last year's 100 outstanding innovations, can place the United States in the forefront of a new technology, that of laboratory-scale x-ray lasers.

On another front, for several years now, scientists have been exploring a new approach to generating electromagnetic radiation, known as "free electron laser." Recently, researchers from the

Lawrence Berkeley and Lawrence Livermore Laboratories invented and demonstrated a method of using free electron lasers to generate, with great efficiency, extremely powerful beams of electromagnetic radiation. Their approach formed the basis for a major free electron laser development project for defense applications, now underway at Livermore.

OTHER BES ACCOMPLISHMENTS

Each of our other subprograms in BES have accomplishments similar to the ones I have just discussed. I don't want to elaborate on each of them, but I would like to mention three examples of accomplishments from the other subprograms within BES (Applied Mathematical Sciences, Engineering and Geosciences, and Biological Energy Research).

In the Applied Mathematical Sciences area, a new class of high resolution finite difference methods for modeling compressible fluid flow problems with discontinuities has been developed. These methods incorporate the nonlinear wave propagation properties into the algorithm, leading to methods that are stable and robust in the neighborhood of shock waves and slip surfaces and are still highly accurate in regions of smooth flow. These methods have resolution capabilities that are close to the theoretical maximum attainable and represent a major advance in the state-of-the-art that is unlikely to be surpassed in the near future. These methods are being incorporated into large application programs used in the weapons design and laser fusion projects.

In the Engineering subprogram, considerable progress is being made on new design methods for electrical equipment which use magnetic materials; e.g., motors, generators, and transformers. Magnetic materials suffer from hysteresis. Under cyclic excitation, such as alternating current, hysteresis causes ambiguities in the behavior of electromagnets, with the state of the magnet depending on its past history. The presence of those ambiguities has imposed constraints on the design of electrical equipment. In general, the constraints are reflected in more costly, less energy efficient electrical systems, ranging from power generating plants, through components for electric power distribution, down to consumer products. Recent research, involving the use of certain novel non-linear mathematical operations, has yielded a method for resolving the ambiguities, thus leading to new, more powerful design methods, and eventually to improved electrical machinery and transmission systems.

In the Biological Energy Research program, one major achievement has been the complete elaboration of the metabolic pathway of methane gas formation from carbon dioxide in organisms that inhabit various anaerobic environments including man-made systems (digestors and some sewage treatments) and natural systems (swamps, animal digestive tracts, sediments). This pathway is a unique one in which an entirely distinct set of cofactors and enzymatic reactions have been characterized and described biochemically. These contributions are crucial to designing new approaches for enhanced biological methane production and to better understanding of the position of methane in the global carbon cycle.

BASIC ENERGY SCIENCES FACILITIES

The kind of research progress depicted by the above examples is made possible, in part, by the large state-of-the-art facilities that are supported by the BES program. These facilities are not only an integral part of the Basic Energy Sciences program, but they also serve the general scientific community. Industry, university, and Government researchers have access to these facilities for promising research projects. These facilities are available at no cost to the user if the project is of high technical merit, cannot be carried out without access to the facility and is not proprietary. If the research requires the use of the facility but is of a proprietary nature, a user fee is charged. This combination of laboratory, university and industry researchers working side by side is extremely beneficial. The Government gains because researchers supported by our program interact with their counterparts in the private sector and have access to the unique instrumentation and equipment that are provided at no cost to the Department by these counterparts. Both industry and the university communities gain by having access to some of the most advanced facilities in the world.

Several state-of-the-art facilities are in operation. Each promises to open whole new areas of research opportunities. These facilities include: the National Synchrotron Light Source (NSLS) at Brookhaven National Laboratory; the Intense Pulsed Neutron Source (IPNS) at Argonne National Laboratory; the 1.5 MeV High Voltage Electron Microscope and the Atomic Resolution Microscope (ARM) located at Lawrence Berkeley Laboratory's National Center for Electron Microscopy; and the Combustion Research Facility (CRF) at Sandia Livermore. As an example of the type of U.S. industrial research possible at one of the National user facilities, I would like to briefly discuss the research at NSLS.

NATIONAL SYNCHROTRON LIGHT SOURCE

There has been a very enthusiastic response to the NSLS from industrial scientists performing experiments on the x-ray and vacuum ultraviolet (VUV) storage rings. The industries presently involved with the NSLS include Allied Corporation, Ashland Oil, AT&T Bell Labs, DuPont, EXXON, General Electric, Gulf, IBM, Mobil, Stouffer Chemical, Union Carbide, Universal Oil Products, and

Xerox. These industries are interested in a wide variety of research that they expect may ultimately lead to significant technological innovation. It is worth mentioning several of the primary areas of investigation below.

MICROELECTRONICS

There is a large program being carried out by IBM scientists in the area of microelectronics. On Port U6 of the VUV storage ring, highly-collimated intense soft x-ray beams have been used to replicate sub-micron integrated circuit features onto photoresist materials. Features as small as 0.25 micron (one-one hundred thousandth of an inch) have been replicated successfully with high aspect ratios. With the addition of a temperature-controlled clean room to provide stable, contamination-free exposures, and an alignment system capable of producing circuit dimensions smaller than 0.5 microns, IBM plans to fabricate an experimental working integrated circuit.

If the IBM effort on U6 proves the technical feasibility of using synchrotron radiation for microcircuit replication, there could be a greatly expanded use of synchrotron radiation in this country with storage rings becoming an integral part of semiconductor factories. Indeed, efforts have begun in Germany and Japan to develop compact superconducting storage rings for the semiconductor industry. The NSLS is organizing a workshop this month to consider how a similar effort might be undertaken in the U.S. and what would be the roles of private industry and of the Federal Government (through the expertise and the facilities of the National laboratories).

CATALYSIS

A number of the companies mentioned above have a common interest in studying catalytic reactions in the hope of developing more efficient catalysts. By using the high intensity synchrotron radiation available from the NSLS, it will be possible to complete x-ray absorption and diffraction studies of catalysts during active operating conditions (elevated temperature and pressures) while the surfaces still remain active. These studies should help determine the structures and orientations of complicated organic molecules during catalysis. EXXON scientists on beam X10 are also using small angle x-ray scattering to study the pore structures in rock since this relates to the rate of flow of oil through various geological formations. The same technique is also being used to characterize the aggregation of organic macromolecules in petroleum crude since this has a direct bearing on the refining process.

STRUCTURE OF MATERIALS

There have been a number of experiments carried out by scientists from industrial laboratories in the area of structure of materials. Examples include the first structure determination of alpha-chromium phosphate by a DuPont team using the X13 powder diffraction beam, and a study carried out on the X11 beam of chromate and dichromate corrosion inhibitors in aqueous solutions for aluminum and its alloys.

University and Government laboratory scientists have carried out a wide range of topography and x-ray diffraction, absorption, and scattering experiments on technologically important metal alloys and semiconductors to study defects and microstructures. The success of these experiments is leading to expanded use of NSLS by materials scientists from all sectors of the scientific community.

A list of the major BES user facilities is contained in Table 6.

FY 1987 BASIC ENERGY SCIENCES BUDGET REQUEST

The FY 1987 budget request for the BES program is $441.4 million, which consists of $380.1 million in Operating Expenses, $31.8

million in Capital Equipment and $29.5 million in Construction funds (Table 7). This request supports the core program for each of the research areas with modest increases in each of the subprogram areas for major user facility operations and for enhancements to selected promising research areas. The requested increase for facilities will cover increased costs related to power, fuel, and essential operating personnel, as well as safeguards and safety requirements.

Of the total FY 1987 Operating Expenses request of $380.1 million, approximately 30% will be spent to operate and carry out research at the major BES facilities. As I noted earlier, these facilities are used not only by the Department, but also by other Federal agencies, by industry and by university researchers. They represent an investment in the Nation's long-term research and technological future. The budget request will ensure continued operation and access to these facilities in FY 1987. In addition

Table 6
Basic Energy Sciences Facilities

High Flux Beam Reactor (HFBR) - Brookhaven National Laboratory
National Synchrotron Light Source (NSLS) - Brookhaven National Laboratory
Intense Pulsed Neutron Source (IPNS) - Argonne National Laboratory
High Voltage Electron Microscope-Tandem Facility - Argonne National Laboratory
Oak Ridge Electron Linear Accelerator (ORELA) - Oak Ridge National Laboratory
High Flux Isotope Reactor (HFIR) - Oak Ridge National Laboratory
Combustion Research Facility (CRF) - Sandia National Laboratories, Livermore
National Center for Electron Microscopy - Lawrence Berkeley Laboratory
Stanford Synchrotron Radiation Laboratory (SSRL) - Stanford University
Los Alamos Neutron Scattering Center (LANSCE) - Los Alamos National Laboratory

Table 7
Basic Energy Sciences
Budget Authority
($ in millions)

	FY 1985	FY 1986		FY 1987
	Conf. Approp.	Conf. Approp.	Adjusted	Request
Operating Expenses				
Materials Sciences	$132.2	$139.5	$134.3	$156.9
Chemical Sciences	78.6	81.2	78.1	86.4
Nuclear Sciences	39.6	43.1	41.4	46.9
Applied Mathematical Sciences	34.5	39.4	37.9	32.8
Engineering and Geosciences	26.1	26.6	25.6	29.4
Advanced Energy Projects	10.1	7.6	7.3	9.0
Biological Energy Research	12.4	12.4	12.0	14.6
Program Direction	3.8	3.6	3.5	4.1
Subtotal	$337.3	$353.4	$340.1	$380.1
Capital Equipment	31.1	27.3	26.2	31.8
Construction	42.4	70.1	67.5	29.5
Total Basic Energy Sciences	$410.8	$450.8	$433.8	$441.4

to maintaining existing facilities, the FY 1987 budget also begins the necessary first step toward meeting the Nation's need for the next generation of advanced facilities.

The highest priority BES-related facilities proposed are: 1-2 GeV Synchrotron Radiation Source (LBL), continued research and development on the 6 GeV Synchrotron Radiation Source (ANL), and research and development of an Advanced Steady State Reactor (ORNL). The concept and need for these facilities have been reviewed and recommended by several committees, most notably and recently the National Research Council (NRC) study of Major Materials Facilities and the DOE Energy Research Advisory Board review of the NRC report. The 1-2 GeV facility is being proposed for construction by requesting architect-engineer and long-lead procurement work in FY 1987, since significant preconstruction R&D has been conducted in the past. Research and development for the 6 GeV facility and the Advanced Steady State Reactor will be continued.

The FY 1987 budget request also continues support for the materials initiative that began in FY 1984. That activity currently consists of a Center for Advanced Materials at LBL, improvements at the Stanford Synchrotron Radiation Laboratory and expanded activities at the BNL National Synchrotron Light Source.

The economic health and National security of the U.S. require that we maintain a commanding lead in high technology. The ongoing advanced materials research activity is being organized to provide maximum benefit to the Nation. Industry is participating in the design of the research program to assure that it addresses America's high technology needs.

The Capital Equipment request for FY 1987 is $31.8 million. The requested funding will assure that researchers involved in our program continue to have the modern, sophisticated equipment needed to conduct advanced research. This level of funding is necessary to meet ongoing research requirements, additional commitments associated with the new facilities and additional equipment for selected areas of promising research. Examples of equipment to be purchased include high resolution nuclear magnetic resonance equipment, computer peripherals (e.g., disk and tape units), a fluid chromatograph for use in analyzing chemical solutions, infrared spectrometers, chemical vapor deposition apparatus, and an x-ray microprobe analyzer.

Table 8 details the Construction request for FY 1987. Three of the projects, as mentioned earlier, are associated with the materials initiative which began in FY 1984: the Center for Advanced Materials (CAM) at LBL, the Stanford Synchrotron Radiation Laboratory (SSRL), and the National Synchrotron Light Source (NSLS) at BNL.

The CAM project consists of two buildings: a Surface Science and Catalysis Laboratory which will provide state-of-the-art instrumentation and facilities and the Advanced Materials Laboratory which will be devoted to interdisciplinary study of the synthesis and characterization of energy-related high technology and strategic materials. Both of these facilities will be based

Table 8
Basic Energy Sciences
Construction Summary
Budget Authority
($ in millions)

	FY 1987 Request	TEC	Completion Date
Center for Advanced Materials (84-ER-112)	$ 10.5	40.2	FY 1988
Beam Lines and Support Area Construction, NSLS (84-ER-111)	2.6	19.4	FY 1987
Stanford Synchrotron Radiation Laboratory Enhancement (84-ER-113)	1.7	12.8	FY 1987
Kansas State University Ion Collision Physics Facility (85-ER-403)	1.2	$ 5.0	FY 1988
Neutron Scattering Experimental Halls, LANL (87-R-403)	5.0	17.5	FY 1989
General Plant Projects (87-R-400)	4.1	4.1	FY 1988
Accelerator Improvements and Modifications Projects (87-ER-401)	2.9	2.9	FY 1988
1-2 GeV Synchrotron Source (87-R-406)	1.5	1.5	AE and Long Lead Procurement
Total	$29.5		

on strong programs that exist at the Lawrence Berkeley Laboratory. The FY 1987 budget includes $10.5 million for this project.

At NSLS. $2.6 million is requested in FY 1987. This funding completes the project and will meet the demands for a much higher level usage by providing additional experimental equipment and space. When fully instrumented, the NSLS facility will be able to accommodate 90 experiments simultaneously.

For the SSRL, the FY 1987 request is $1.7 million to complete the project. This funding will allow us to continue three principal items: the construction of two conventional beam lines and three special beam line facilities as well as the alteration of the electron storage ring. These improvements will ensure the usefulness of this facility for basic research for many years to come.

Another major project proposed for final funding in FY 1987 is the Kansas State University Ion Collision Physics Facility; $1.2 million is requested for this project. This facility, which is jointly funded by the University and DOE, will allow researchers to study the atomic physics of a range of ions unmatched in the world.

The budget also includes $5.0 million for continuing the Neutron Scattering Experimental Hall project at LANL, which was begun in FY 1986. As a result of this project, a significant enhancement in research space will be made available to take advantage of the unique (highest neutron-flux in the world) capability at this facility.

Construction funds are requested also for General Plant Projects and Accelerator Improvement and Modifications Projects. For these two construction items, the FY 1987 request is $4.1 million and $2.9 million, respectively.

The final project for which FY 1987 funding is requested is $1.5 million for A-E and long-lead procurement for the 1-2 GeV Synchrotron Source. This facility, as I mentioned earlier, is a state-of-the-art synchrotron source which is a necessary step in keeping the U.S. at the cutting edge of technology in the next century.

The budget request for Program Direction provides for personnel and other costs associated with continuation of 63 full-time equivalents.

MAGNETIC FUSION ENERGY

To assure our National long-term energy options, it is appropriate for the Federal government to sponsor R&D in those areas where the cost or duration of the program discourages private investment. The Magnetic Fusion program is a clear example of appropriate energy research for the Federal portfolio. The goal of this program is to establish the scientific and technological base required for fusion energy. The program is making excellent technical progress toward this goal. The long-term need and desirability for fusion energy continues to be strong. However, the program plan and the program budgets have been adjusted to reflect improvements in our near-term energy supply as well as the need to control Federal spending. During the mid-1970's the Magnetic Fusion Energy program responded to the then looming energy crisis, by laying out a plan that was dedicated to the goal of having a fusion energy reactor by the year 2000. A set of program activities was developed and a pace established to meet this goal. However, due to a relaxation in the energy crisis situation, there is now less urgency to develop an energy supply system based on the nuclear fusion principle. The desirability for such a system, however, remains strong.

Therefore, a revised Magnetic Fusion Program Plan was developed and put into place last year. This plan took into consideration the present economic conditions, the current energy situation and how it might change in the future, technical progress in fusion research, the ability to train scientists and engineers, the contributions to basic research in the fields of plasma physics and atomic physics and technology transfer. This plan has been accepted by both the Congress and the technical community.

The development of magnetic fusion could lead to economic energy sources that possess a secure fuel reserve, as well as acceptable environmental and safety features. The fuel, deuterium (and tritium from lithium), is readily available at low cost, and its supply is essentially unlimited. Potential end use applications are electricity generation, the production of synthetic fuels, nuclear fuels, and high grade heat for industrial applications.

The schedule for completion of magnetic fusion development is directly related to the present technical, economic, and political uncertainties of energy supply. Knowledge of how to employ fusion power, its economic costs and its environmental effects should be available when major decisions must be made on the deployment of new energy systems. It follows that, based on the estimated timescales for the resolution of uncertainties affecting the acceptability of other energy sources, the scientific and technological base for fusion should be available essentially by the turn of the century.

Fusion has a unique role in the process of determining our Nation's energy future. In principle, fusion energy has the flexibility to fit a variety of future energy scenarios. Fusion may provide improvements to the attractiveness of other energy sources as well as providing an attractive alternative to these sources.

Although magnetic fusion research and development is addressing a wide range of detailed scientific and technological problems, the remaining work that must be accomplished to reach the program goal can be summarized by defining four key issues.

The first of these issues concerns magnetic confinement systems. The particular type of magnetic geometry used can have a profound influence on the economics of a fusion device. Although significant progress continues to be made, it is not possible to design a fusion reactor at this time. Therefore, several potentially attractive confinement systems are being investigated. While many of these have similar features, it is likely that the most desirable system will include features from several different confinement systems. In addition, history has shown that progress in all systems will be more rapid because of the cross-fertilization possible between related concepts.

The second key technical issue concerns the properties of burning plasmas. Understanding the properties of burning plasmas is required to complete the scientific base. Furthermore, since a burning plasma will require much of the technology required for a fusion reactor, it offers the additional benefit of advancing the technological position of the program goal.

The third key issue concerns materials for fusion systems. Since materials play a central role in determining the environmental characteristics of a fusion reactor, they are the key to realizing the benefits of fusion. Achievement of the program goal requires the development of new materials to enhance the economic and environmental potential of fusion.

The fourth key issue concerns nuclear technology of fusion systems. This issue requires advances in the basic engineering sciences, as well as the application of the results of basic fusion materials research. This issue will be completed only when integrated blankets are tested in a nuclear environment.

Our present strategy for addressing these issues is to take a complementary approach, which emphasizes development of the scientific and technological components or subsystems of the integrated fusion system, to the maximum extent that is technically feasible.

This approach is most appropriate for our program goal in the present circumstances. It allows accommodation of budget stringency, as well as for progress to resolve the technical uncertainties that exist about the exact nature of a suitable fusion reactor. There appears to be no premium on early deployment of fusion in our present energy circumstances. Therefore, time is available to perfect the fusion energy source, which we expect to be a critical necessity in the long run.

Finally, the utilization of the United States portion of the world's fusion development resources can be enhanced by this approach, since it provides the flexibility to collaborate internationally.

The essence of the program strategy is to maintain a broad domestic research and development program with emphasis on establishing the basic elements (components or subsystems) of the science and engineering technology required for fusion. Given the revised program goal, a great emphasis will be placed on creativity and innovation to enhance the economic and environmental attractiveness of fusion as an energy source, which will be assessed in comparison with other potential energy sources.

The focus on the practical energy goal of the program will be provided by fusion system studies. Technology transfer will be pursued by seeking industrial and utility participation in these system studies, as well as in appropriate research and development activities. To make best use of United States scientific strength in the area of fusion plasma research, a number of magnetic confinement systems, which offer promise of superior reactor performance, will be investigated. However, recognizing constraints on available resources, this investigation will emphasize increasing scientific understanding of the unique features of the most promising concepts, rather than attempting to develop each as a separate reactor system. To achieve a complete scientific base, we will address the scientific issues of fusion in depth through the generation and study of high temperature plasmas in facilities of appropriate size and scope, including a burning plasma experiment. In the latter experiment, the lowest cost magnetic confinement system that can meet the scientific objective will be sought. This approach is intended to provide the broadest understanding at minimum cost and is most appropriate for the present stage of fusion development.

Over the last decade, a significant investment in equipment and facilities has been made and a core group of skilled scientists and engineers has been trained. With this investment in place, excellent and sustained progress is being made. We have reached a point now where there is general agreement that the remaining technical problems can be solved. The new generation of tokamaks has produced temperatures of one hundred million degrees and average energy confinement times of nine-tenths of a second. The experimental campaign to achieve energy breakeven conditions has just begun in the Tokamak Fusion Test Reactor (TFTR) at Princeton University. It appears that 1986 will mark the achievement of a goal sought for nearly 40 years. The general scientific progress of the last decade has also advanced the performance and future prospect of several other magnetic confinement systems. Several toroidal systems have achieved a state of scientific maturity such that they appear capable of exceeding the power density necessary to be a competitive economic power system.

On the technology side, a reactor-scale tritium fueling system is operating at Los Alamos National Laboratory. The International Large Coil Project at Oak Ridge National Laboratory is beginning operation to demonstrate reactor-scale superconducting magnets. Radio-frequency heating modules at reactor power levels and pellet fueling systems have been developed and applied to our largest experiments. The feasibility of materials which are long lived in a fusion environment has been established for two classes of alloys. Initial work on the development of second generation low activation materials shows good promise.

While unresolved scientific and technological problems remain, the key achievements that were targeted by the program in the planning of the mid-1970's have or are being realized. However, it is almost axiomatic that achievement of the technical goals of a ten-year program plan requires the revision of future program goals to fit new externalities.

FY 1987 BUDGET REQUEST

The FY 1987 budget request for Magnetic Fusion Energy is $333.0 million. The request includes $307.5 million for Operating Expenses, $17.3 million for Capital Equipment, and $8.2 million for Construction (Table 9).

Table 9
Magnetic Fusion Energy
Budget Authority
($ in millions)

	FY 1985	FY 1986		FY 1987
	Conf. Approp.	Conf. Approp.	Adjusted	Request
Operating Expenses	$369.6	$337.3	$324.5	$307.5
Capital Equipment	27.5	29.4	28.3	17.3
Construction	32.5	13.1	12.7	8.2
Total	$429.6	$379.8	$365.5	$333.0

Given this current technical status and the revised program strategy, the FY 1987 budget request was developed with two major factors in mind. The first is a need to maintain a balance between our domestic science and technology program and those abroad, in order to allow effective international collaboration to supplement our domestic activities. The second is the need to support those experimental investigations that are appropriate in order to maintain progress. Facilities that are large enough to explore high temperature regimes of plasma physics are required, as well as a number of smaller facilities for investigating key problems or scientific issues that can be addressed at more modest plasma temperatures.

The FY 1987 budget request has been developed to take advantage of the technical position that already has been established in fusion research. It will allow a continuation of cost effective progress toward the development of fusion power as a future energy option and positions the program to support the President's Geneva initiative on international cooperation in this area.

The request of $333.0 million represents the level of resources required to maintain an effective program. In order to maintain progress at this level of funding, the program has been narrowed to pursue only toroidal confinement systems. In addition, we have identified the highest priority tasks, improved the cost effectiveness of facility operations, and increased the use of international collaboration. The program has been focused to address the four remaining key technical issues--namely, the development of magnetic confinement systems, understanding of scientific principles of a burning plasma, the development of materials for fusion applications, and the development of fusion nuclear technology.

The FY 1987 budget request of $333.0 million will maintain some effort in each of the four key technical issues. At this level the FY 1986 initiatives needed to implement the revised program plan continue while other program elements are delayed or deferred. In the Applied Plasma Physics subprogram, a core base of research is maintained. The two major device fabrication projects that were initiated in FY 1986, the reversed field pinch experiment and a compact toroid experiment will be continued. In the Confinement Systems subprogram, TFTR will attempt to reach breakeven conditions in deuterium plasmas and preparations will continue for limited D-T operation in 1989. As part of the US/Japan cooperation program, Doublet III will explore beta limits with shaped plasmas. Collaboration abroad, especially on European tokamaks, will continue. Collaboration on these tokamaks allows the U.S. to gain valuable information while avoiding duplication. Studies to support expanded collaboration with the Soviets will begin. In the advanced toroidal area, the PBX at PPPL and the ATF at ORNL will begin operation. In the tandem mirror area, the TMX-U and TARA experimental programs will be completed. The MFTF-B will be mothballed. In the Development and Technology subprogram, design studies on an experiment to study the physics of ignition will be continued. Facility design and development of ion cyclotron radio-frequency heating components will be emphasized. The six coil test in the International Fusion Superconducting Magnet Test Facility at Oak Ridge National Laboratory will be completed. The ongoing materials program will be maintained at a minimum level to support international collaboration in this area, and small-scale laboratory tests of critical blanket issues will be carried out.

The budget request for FY 1987 reflects a significant shift in the program balance. The near-term scientific and technological output of the program will be emphasized while continuing to pursue the long-range goal of developing fusion at a pace consistent with our national energy needs. The near-term program achievements also will continue to include the production of well trained scientists and engineers and contribution of advanced technology developments for industrial and defense applications.

The Magnetic Fusion Energy budget is organized into five interrelated functional areas that form the basis of a unified and balanced effort to conduct the research and development necessary to define a practical fusion product. The Confinement Systems and the Applied Plasma Physics subprograms, working in conjunction, provide the physics base for the Magnetic Fusion Energy program. In the near-term, the achievement of plasmas with the characteristics required to produce fusion energy flow from the experiments conducted in the Confinement Systems subprogram, with its focus on toroidal confinement systems.

The Applied Plasma Physics (APP) subprogram develops plasma physics theories and models to predict and explain the experimental and theoretical investigations of basic physics problems related to confinement concepts and develops diagnostic instruments for use by the Confinement Systems subprogram.

Using information developed by these two subprograms, the Development and Technology subprogram develops components and systems for use in near- and mid-term fusion experiments, and long-term generic materials. This subprogram also performs conceptual design studies for fusion power reactor concepts and next generation devices. These design studies identify component and system development needs that must be undertaken to prepare for the eventual application of fusion.

In carrying out the assignments of the physics and technology tasks, needs for major new facilities are identified from time to time. The Planning and Projects subprogram provides for construction of major new facilities and fabrication of auxiliary components for these facilities. Finally, the Program Direction subprogram includes the funding to cover salaries, benefits, travel, and associated expenses of the Headquarters Office of Fusion Energy and associated support staff. The proposed budget levels for these areas are indicated in Table 10.

Table 10
Magnetic Fusion Energy
Budget Authority
($ in millions)

	FY 1985	FY 1986		FY 1987
	Conf. Approp.	Conf. Approp.	Adjusted	Request
Operating Expenses				
Confinement Systems				
Toroidal Confinement Systems	$151.4	$147.1	$141.5	$151.8
Mirror Confinement Systems	55.0	49.0	47.1	25.7
Applied Plasma Physics	78.9	72.4	69.7	70.7
Development and Technology	67.9	59.3	57.1	50.5
Planning and Projects	12.2	5.7	5.5	4.8
Program Direction	4.2	3.8	3.6	4.0
Subtotal	$369.6	$337.3	$324.5	$307.5
Capital Equipment	27.5	29.4	28.3	17.3
Construction				
Fusion Materials Irradiation Test Facility	3.0	0	0	0
Mirror Fusion Test Facility-B	20.1	4.0	3.9	0
General Plant Projects	9.4	9.1	8.8	8.2
Subtotal	32.5	13.1	12.7	8.2
Total	$429.6	$379.8	$365.5	$333.0

I would like to highlight some of the significant provisions of the FY 1987 budget request. In toroidal confinement systems, funds are provided to support the experimental operations of the Tokamak Fusion Test Reactor (TFTR) and the Princeton Beta

Experiment (PBX) at the Princeton Plasma Physics Laboratory; the Doublet III-D (D-IIID) at General Atomic Technologies, Inc.; and the Advanced Toroidal Facility (ATF) at the Oak Ridge National Laboratory. The TFTR device will attempt to reach breakeven conditions and continue preparation for limited D-T operations in 1989. Doublet III-D, operating with a new vacuum vessel, will explore beta limits with shaped plasmas as part of the U.S./Japan cooperative program. In addition, procurement of long pulse ion sources for the device will be completed. Fabrication of the ATF and PBX-Upgrade will be completed and operations will begin to investigate advanced toroidal ideas. The Alcator C at the Massachusetts Institute of Technology and Princeton Large Torus experiments will be completed and the devices shut down. Collaboration abroad, especially on European Tokamaks, will continue.

Studies to expand collaboration with the Soviets will begin in order to position the program to support the President's Geneva initiative on international cooperation in fusion.

In the Mirror Confinement System program, the Tandem Mirror Experiment (TMX-U) at Lawrence Livermore Laboratory, TARA at Massachusetts Institute of Technology, and Phaedrus at the University of Wisconsin will be completed and the devices will be shut down. The MFTF-B facility at LLNL will be put in standby condition after completion of the construction project in FY 1986. This decision was made recognizing that increased fiscal stringencies would not allow us to continue support of all experimental devices. Since the toroidal configuration is the most developed of all concepts, we have chosen to focus the experimental physics effort around the toroidal concept.

In the Development and Technology area, program effort will be focused on the most critical technology issues. Experiments on the International Superconducting Magnet Test Facility at the Oak

Ridge National Laboratory will be completed. Design of ion cyclotron radiofrequency heating components is to be emphasized. Nuclear technology effort will include nuclear analysis methods, blankets, and tritium processing and control systems. In the materials program, effort on plasma materials and interactions and reduced activation and fundamental studies on neutron effects on alloys will continue with transition from the Oak Ridge Reactor to the High Flux Isotope Reactor. Design of an ignited, burning plasma experiment will continue.

In Planning and Projects, funds are provided to support the program's landlord reponsibilities at ORNL for GPP, GPE, and inventories, as well as the legislated requirements for the Small Business Innovation Research program.

The budget request for Program Direction provides for personnel and other costs associated with continuation of 62 full-time equivalents.

BIOLOGICAL AND ENVIRONMENTAL RESEARCH

The BER program has two main goals: (1) to develop the knowledge base and scientific principles necessary to identify, understand and anticipate the long-term health and environmental consequences of energy use and development; and (2) to utilize the Department's unique scientific and technological capabilities to address major scientific problems in medicine and biology. The FY 1987 budget request will support a program of fundamental and applied research of the highest quality that aims at these goals, and that, at the same time, will continue to contribute to the Nation's economic growth and well-being.

The principal strategy for meeting the first goal has been the development of a long-term research program that is quantitative and mechanistic in its level of understanding, and comprehensive and multidisciplinary in its scope. The need for a strategy with these particular elements is tightly coupled to the mission of the Department. Long-range, quantitative research is dictated by the requirement for broadly generalizable knowledge from which predictive principles can be formulated. Predictive principles permit assessment of energy strategies before they are adopted. They contribute to the health of the Nation by providing the ability to avoid unacceptable impacts prior to, rather than subsequent to, their occurrence; they strengthen the economy by giving us the means to avert major economic stress associated with abrupt discontinuities in energy programs; and they allow us to optimize approaches to mitigating past mistakes. In short, predictive principles provide the basis for rational planning and allocation of resources, and for minimizing adverse health and environmental impacts on future generations as well as on our own.

The comprehensive and multidisciplinary nature of the BER program is unique to the Nation, and arises as a natural consequence of the mission and capabilities of the Department of Energy. Predicting the health impacts of current or anticipated energy strategies requires understanding the health effects of the products of these strategies. But it also requires an understanding of the physics and chemistry of transport and transformation of energy byproducts in terrestrial, marine and atmospheric environments, as they move from source to receptor. A comprehensive approach to the problem clearly requires the type of interdisciplinary strength and coordinated effort for which the National laboratories are so well known. In the case of the environmental research program, these intellectual strengths are complemented by extraordinary field-study capabilities offered by the National Environmental Research Parks.

Because of the unusual characteristics of the BER program and the unique strengths which the Department can bring to bear on major life science problems, the program has spawned scientific and technological discoveries whose implications have far exceeded original programmatic goals. The wide-ranging implications of these accomplishments can be conveyed by a few brief examples.

Basic research, sponsored by the health effects program, aimed at understanding the mechanisms by which radiation interacts with, and damages, biological molecules led to the discovery of repair enzymes. Subsequent research has provided major insights into the genetic determinants of susceptibility and resistance to disease in general, and in particular, it has led to the discovery that certain types of cancer are strongly associated with repair enzyme deficiencies.

Similarly, the program in atmospheric physics and chemistry, which began in the early 1950's in response to a need for understanding the movement of radionuclides through the atmosphere, has turned out to be central to approaching problems such as acid rain, and to understanding the causes and effects of changes in the atmospheric concentration of carbon dioxide and other "greenhouse molecules".

Finally, in the area of measurement science, the cell sorter was originally developed to separate radiation damaged cells from normal cells. Today it is routinely used for performing complete blood counts, for detecting cancer and monitoring its treatment, and for detecting genetic abnormalities. More recent improvements have permitted the development of a chromosome-specific DNA library which is expected to have a major impact on the field of human genetics. Since flow cytometry is now a standard analytical technique in cell biology, its full impact is difficult to summarize, but many scientists consider it perhaps the single most important analytical advance in the history of cell biology.

The scientific and economic implications of these contributions and many others like them have been analyzed recently and will be available for distribution in mid-1986; our best estimates indicate that on the basis of economic impact alone, the public's investment in the BER program and the programs that preceded it has been returned manyfold.

The second goal of the BER program (i.e., to utilize the Department's unique scientific and technological capabilities to address major scientific problems in medicine and biology) had its origin in the 1947 mandate from Congress to utilize advances in nuclear science for the treatment of human disease. At the time the mandate was written, even the most farsighted scientists and legislators would have had difficulty predicting the enormous contributions that the large multiuser facilities and their associated intellectual and advanced technological capabilities could bring to a wide range of problems, not just in medicine, but in basic biology as well. The significance of the latter is embodied in the burgeoning of biotechnology. As I will indicate below, the intellectual tools and resources for research breakthroughs needed by the private sector for applications in the coming decades, exist today, in their most powerful configuration, in the National laboratories.

Historically, the focus of this research has been on nuclear medicine -- the development and application of non-invasive imaging techniques, the production of isotopes for the study of metabolic and other kinetic processes, and the production of radiopharmaceuticals for the treatment of cancer and other diseases. These advances have cured or alleviated the sufferings of tens of millions of people throughout the world, and have spawned industries with markets valued at hundreds of millions of dollars per year. More recently, another non-invasive imaging technique, non-nuclear in nature, has been developed. This method, called magnetoencephalography, measures changes in magnetic fields generated by the firing of neurons, and offers great promise for major progress in our understanding of neurological processes. In the future, the scope of this research endeavor will broaden considerably, to take full advantage of the unique capabilities of the Department's laboratories for helping to solve the Nation's major medical and biological problems.

FISCAL YEAR 1987 BIOLOGICAL AND ENVIRONMENTAL RESEARCH BUDGET REQUEST

The FY 1987 budget request for the BER program is $196.6 million. Within this request, $184.6 million is for Operating Expenses; $8.5 million is for Capital Equipment, and $3.5 million is for Construction (Table 11). Funding by research area is shown in Table 12.

Table 11
Biological and Environmental Research
Budget Authority
($ in millions)

	FY 1985	FY 1986		FY 1987
	Conf. Approp.	Conf. Approp.	Adjusted	Request
Operating Expenses	$177.9	$176.0	$169.4	$184.6
Capital Equipment	7.1	7.8	7.4	8.5
Construction	2.7	3.2	3.1	3.5
Total	$187.7	$187.0	$179.9	$196.6

Table 12
Biological and Environmental Research
Budget Authority
($ in millions)

	FY 1985	FY 1986		FY 1987
	Conf. Approp.	Conf. Approp.	Adjusted	Request
Late Effects on Health & Environment of Energy Development and Use				
Source and Dose Determination	$ 15.6	$ 15.3	$ 14.8	$ 16.6
Environmental Processes & Effects	32.4	31.1	29.9	32.9
Health Effects	63.4	59.9	57.7	65.9
General Life Sciences	28.5	29.1	28.0	29.9
Nuclear Medicine	21.3	24.2	23.3	22.1
Carbon Dioxide Research	13.1	13.1	12.6	13.6
Program Direction	3.5	3.3	3.1	3.6
Facility Operations	9.9	11.0	10.5	12.0
Total	$187.7	$187.0	$179.9	$196.6

In order to meet its first goal (i.e., to develop the knowledge base and scientific principles necessary to identify, understand and anticipate the long-term health and environmental consequences of energy use and development), the BER program supports four major research areas. These areas are: Source and Dose Determination; Environmental Processes and Effects; Health Effects; and General Life Sciences.

The Source and Dose Determination research program, with an FY 1987 Operating Expenses request of $16.6 million, develops methods and procedures for qualitative and quantitative characterization of radiation and toxic chemicals to which human or ecological populations are exposed. This is the initial step necessary in estimating consequent health effects. Analytical studies are pursued to define the chemical and physical nature of the source. Dosimetry research aims at improving methods for the direct determination of human exposure.

Research in measurement science develops the advanced instrumentation required to pursue effectively the broad scope of the health and environmental effects research program. Progress on many of the problems that must be solved for assessing health and environmental impacts is heavily dependent on advances in measurement science for precise monitoring and diagnosis. The development of new techniques such as remote fiber fluorimetry permit the possibility for chemical monitoring in hostile or inaccessible environments. This particular method is expected to be applicable to problems ranging from in vivo measurements to assessments of ground water contamination. Another method under development, fluorescence line narrowing spectroscopy (FLNS), can distinguish isomers of polycyclic aromatic hydrocarbons. The significance of this is that structurally identical isomers that bind to DNA differ considerably in their carcinogenic activity. FLNS is sensitive enough to detect one such molecule in 100 million DNA bases. Further developments in this and similar methodologies will permit the identification of individuals that have been exposed to potential carcinogenic substances, well before irreversible cell transformation occurs. Continued developments in measurement science are expected to yield methods that permit measurements of previously undetectable concentrations of harmful molecules, or of in vivo markers signalling disease onset well in advance of clinical symptoms.

Taking advantage of the data and insights generated by the Source and Dose Determination activity, the Environmental Processes and Effects research area, with a FY 1987 budget request of $32.9 million in Operating Expenses, focuses on the pathways and mechanisms by which energy-related substances move through the environment, and on the ways that the environment itself may be affected by such substances.

The main atmospheric research programs are PRECP (Processing of Emissions by Clouds and Precipitation) and ASCOT (Atmospheric Studies in Complex Terrain). The goal of the first program is to develop a quantitative understanding of the physical and chemical processes responsible for the incorporation and transformation ("processing") of atmospheric pollutants into clouds and storms, and for the removal of those pollutants by precipitation. ASCOT aims at the improvement of fundamental knowledge concerning the processes that are responsible for the dispersion of atmospheric pollutants over complex (e.g., mountainous) terrain.

The PRECP program has completed three large field experiments investigating the removal of pollutants by precipitation by some typical storm types. The information gathered from surface and aircraft measurements in these storms, together with laboratory simulations and diagnostic modeling, have validated hypotheses which are central to national concerns such as the understanding and control of "acid rain".

In ASCOT, three-dimensional models have been developed of the turbulent flows over western mountain-valley systems, which have been tested in seven field campaigns in four states. These and other models developed in this program are directly applicable to emergency response planning and other Departmental concerns.

Research conducted in the marine program on cycling and movement of energy materials off our coasts is providing crucial information for decisions on appropriateness for ocean disposal of atmospheric and terrestrial energy discharges. Since substances move from disposal sites to distant locations, knowledge of where they migrate to and their rates of migration are crucial to making informed choices for disposal sites.

In the terrestrial system, prediction of the distribution and fate of energy-related molecules such as hydrocarbons requires an understanding of the chemical and physical processes that control and affect the transport of chemical compounds in the subsurface environment. A number of new techniques and methods are being developed which will enable us to predict the movement of materials in ground water and their potential infiltration into aquifers used to provide water for human consumption. Since movement depends on soil properties, principles and techniques, along with knowledge of soil characteristics at different DOE sites, will enable us to establish a rational scientifically based set of priorities for cleanup.

Energy production and development can affect water use and produce varying degrees of landscape disturbance. Prediction and mitigation of these impacts can be successful only if basic processes affecting ecosystem functioning are well understood.

Past research conducted under this program has elucidated the sulfur cycle in forested ecosystems and is now providing crucial information on acid rain. Information on carbon cycling developed with support of this program is now a central part of the evaluation of CO_2 buildup.

Research in physiologic ecology includes studies on a basic understanding of the mechanisms of stress and tolerance in marine organisms exposed to contaminants. Our research has shown that in response to heavy metal contaminants, animals synthesize specific proteins (metallothioneins) which bind and sequester metals in the animal, thus, decreasing metal mobility and effects. Companion studies with host-specific intracellular pathogens are being used to investigate the effects of heavy metals on the synthesis of immune proteins which mitigate disease processes. The results of these studies are being used to predict the ecological effects of energy-related contaminants on valued marine species.

The FY 1987 Operating Expenses request for the Health Effects research area is $65.9 million. Recent information indicates that the potential exposures to radon gas and its daughter products in residential structures, and the number of people so exposed, may be substantial. The formulation of a rational strategy for the abatement of the risk, requires the entire spectrum of activities sponsored by the BER program. Thus, fully addressing the issue of radon health effects will not only require the development and testing of models of radon transport through the environment, but also carefully controlled epidemiological studies and fundamental studies of the mechanisms by which radon produces injury.

The epidemiologic research program comprises studies that provide needed scientific data and, at the same time, provide information of important practical significance. These studies include investigations of human populations with occupational or environmental exposure to energy-related pollutants. Among the major populations which have been under study for several years are DOE Workers/DOE contractor workers, Japanese atomic-bomb survivors, nuclear shipyard workers, and New Mexico uranium miners. These population studies will be supplemented by studies of lung cancer cases in communities located near DOE facilities.

During FY 1987, the results of the nuclear shipyard study will come available. These results will greatly refine our confidence in low-level radiation risk estimates which have been developed through extrapolation from populations exposed at high doses and dose rates. The intensive effort to characterize the industrial hygiene aspects of these facilities in order to identify chemical hazards which may be responsible for some apparently deleterious health effects that have been discovered in previous epidemiologic investigations will continue.

The experimental health effects research program uses laboratory-based studies and a multispecies approach to make predictive correlations between cellular/molecular events and whole animal responses, and between laboratory animals and humans. The discovery that DNA damaged by radiation and chemicals could be repaired was a landmark achievement. High priority will be given to the molecular biology of the enzymes that repair damaged DNA and to the genes that control these enzymes. More generally, increased emphasis will be placed on molecular epidemiology including identification of molecular markers for susceptibility and resistance to chemical and radiation damage. Studies will also be made to identify populations that may be especially susceptible to energy byproducts so their needs and concerns can be met early. Research on cancer-related genes, oncogenes, that are activated by radiation and other energy-related materials, will be expanded, and relations will be sought to link them to current DOE-supported epidemiologic studies of cancer in human and animal populations.

The majority of exposures of people to hazardous material is not to single materials but to complex mixtures of chemicals and perhaps even to radiation and chemicals together. Studies of complex mixtures show that their health effects cannot always be predicted by adding the effects of isolated components. To understand this problem a complex mixture program has been initiated to develop predictive principles of toxicity and mutagenicity.

Another major problem is to determine the extent to which radiation and chemical damage to genetic material is transmitted to future generations. This problem is of extraordinary importance since it bears directly on the question of whether decisions made today will effect the burden of disease of future generations. To develop a basis for answering these questions, new molecular approaches will be developed for studying the hereditibility of certain types of molecular, chromosomal and genomic damage.

Research in General Life Sciences, for which $29.9 million in Operating Expenses is requested in FY 1987, provides the fundamental basis of the entire BER program. This research extends our base of biological information and develops concepts to allow the fullest understanding of the health effects of various energy options.

Research in cell biology will be supported to understand the normal processes of cells, their functions and their regulation. An important problem is to understand the factors influencing cell stability and malignant transformation.

Research in molecular biology will focus on the structure and function of the gene at the molecular and chromosomal levels, the arrangement of genes in chromosomes, and how this arrangement affects the way genes are expressed and regulated.

Studies in structural biology will use the special facilities developed by the Department for the analysis of macromolecular structure. Use of the intense neutron beams produced by nuclear reactors and accelerators and the synchrotron light produced by its electron storage rings will permit information to be obtained faster and under more realistic conditions than was previously possible. These experimental capabilities, the Department's powerful computer network, and its unique breadth and depth in the mathematical sciences will lead to new and far more rapid approaches to determining and predicting molecular structure. Progress in this area will have a major impact on the future of biotechnology including protein engineering, and drug and vaccine design.

The second major goal of the BER program is the utilization of the Department's unique scientific and technological capabilities to address major problems in medicine and biology. The development of applications in the field of nuclear medicine has historically been the major program associated with this goal.

The budget request for the FY 1987 Nuclear Medicine Applications program is $22.1 million. Its objective is to continue the development of new nuclear medicine procedures through the production of new radionuclides, the radiolabeling of new biologically active agents, and advancements in instrumentation. Efforts to develop other medical applications using reactors, accelerators and other related nuclear technologies for the treatment of cancer will be maintained.

Recent developments in the BER nuclear medicine program have produced new radiopharmaceuticals labeled with short-lived radionuclides. In syntheses involving the most important positron emitting radionuclides (oxygen-15, 2 minute half life; nitrogen-13 10 minute half life, carbon-11, 20 minute half life, and fluorine-18, 110 minute half life), one cannot use standard techniques.

Rather, innovative rapid organo- and biosynthetic techniques must be developed using the technologies or molecular biology, biochemistry, organic chemistry, hot atom chemistry and radiochemistry.

The new short-lived radionuclide labeled radiopharmaceuticals are proving to be useful in studies of the metabolic functions of the brain and heart. Major advances have been made to date in quantitating hysiology and pathophysiology in the human brain and heart utilizing Positron Emission Tomography. Continued development of advanced tomographic systems will have immediate medical implications in evaluation of stroke patients and diagnosis of degenerative brain disorders such as Alzheimer's, Huntington's and Parkinson's disease.

In FY 1987, research and development will be maintained and devoted to identifying and optimizing techniques for attaching radionuclides to monoclonal antibodies. These homogeneous populations of molecules recognize characteristics which are peculiar to cancer cells. They, therefore, offer the potential for early detection of cancer, for following the response of patients to treatment, and for general cancer therapy. A substantial research and development effort will be required to perfect and evaluate techniques for using labeled monoclonal antibodies. It is anticipated that by FY 1987 work on monoclonal antibodies for cancer therapy will have progressed to the point that one or more of these agents will have been identified as having sufficient potential for clinical trials. In addition, the monoclonal antibody work will be extended to labeling with radionuclides suitable for positron tomographic diagnostic imaging.

The use of magnetic resonance imaging (MRI) spectroscopy to detect carbon-13 and nitrogen-15 labeled metabolic products within intact tissues and cells holds exceptional promise in providing new insight into the mechanisms responsible for metabolic regulation. Because of the great importance of heart disease, current research efforts are focused on the identification of the metabolic effects in the perfused heart model of several proposed therapeutic strategies for treatment of ischemic heart disease. Efforts will be concentrated on obtaining quantitative measurements of metabolic concentrations in the heart.

The Carbon Dioxide Research FY 1987 Operating Request is $13.6 million. Its goal is to develop a sound, quantitative atmospheric carbon dioxide knowledge base to aid in energy policy decision making. It is the position of the Department of Energy that we do not yet have the scientific data base needed to recommend specific, firm energy policy options for consideration of the Congress relating to CO_2 potential impacts.

Based on projections of potential global impacts, we believe we have the time in which to conduct the research necessary to improve estimates of future atmospheric CO_2 which will include better estimates of energy usage and the workings of the carbon cycle, and improve climate modeling to develop regional and seasonal climate estimates as a function of future atmospheric CO_2. These are prime research directions. Because oceans play a major role in the exchange of carbon dioxide with the atmosphere and as a heat engine in relation to global climatic conditions, much more data, analysis and modeling of oceans is required to be able to develop climate and carbon cycle models with which to predict effects of elevated increased atmospheric CO_2 levels. Although improved understanding of the direct effect of elevated CO_2 on crops is beginning to emerge, it is necessary to design experimental methods to determine the first principles which integrate crops, weeds and insects so that an ecological systems model can be developed. Collaborative international research is a necessity if CO_2 research is to be successful, and, to this end, we are working with many international groups and individuals (e.g., PRC, Australia, Switzerland, Canada).

In FY 1986, State-of-the-Art Reports were published on four major components of the Carbon Dioxide Research Program which indicate what we know or do not know, and which identify the key uncertainties in our knowledge and recommend research activities. We intend to vigorously pursue the recommendations of these definitive statements to reduce the current uncertainties in the scientific knowledge base to a level required for effective decision making.

The FY 1987 budget request for Facility Operations is $12.0 million. These funds provide for the necessary capital equipment and general plant project needs to support the BER program and its Pacific Northwest Laboratory landlord responsibilities.

The Capital Equipment request of $8.5 million for FY 1987 is essential for acquiring state-of-the-art equipment, replacement of deterioriated and obsolete instrumentation, and general purpose equipment needs at the Pacific Northwest Laboratory.

The Construction request for FY 1987 is $3.5 million. The request supports the program's General Plant Project needs, and the Pacific Northwest Laboratory landlord responsibility. General plant projects are necessary to accommodate continuing requirements to maintain satisfactory and economic operating conditions, to meet regulatory requirements and to provide for new program developments.

The FY 1987 request for Program Direction is $3.6 million. These funds are required to provide for the personnel costs of 53 full-time equivalents to direct, manage, and support these multidisciplinary research efforts.

This completes my summary of the BER program. I would now like to discuss the several ER outlay programs that are related to my statutory responsibilities to advise the Secretary on DOE energy R&D programs, the non-weapons multiprogram laboratories, and the education and training of scientists and engineers.

ADVISORY AND ASSESSMENT ACTIVITIES

Within the Office of Energy Research, the Office of Field Operations Management (FOM) and the Office of Program Analysis (OPA) support the Director's statutory advisory responsibilities. The Office of Field Operations Management provides support with regard to management oversight of the laboratories and energy-related manpower development and training activities of the Department. The Office has developed policies and several management tools that the Department uses to administer its laboratories and R&D facilities across the country. The office also manages the University Research Support, the University Research Instrumentation, and the Multiprogram Energy Laboratories-Facilities Support programs, each of which I will discuss shortly. The Energy Research Analysis program, managed by the Office of Program Analysis, on the other hand, provides independent and objective program analyses and technical assessments.

ENERGY RESEARCH ANALYSIS

The Energy Research Analysis (ERA) program is the only Departmental program specifically designed to provide independent technical assessments of DOE programs. One of the program's principal tasks is to solicit and obtain credible judgments by premier researchers and expert scientists of the quality of DOE-supported science and its eventual impact. Often following from these judgments are recommendations on the necessary next steps for the research. These recommendations provide independent views on future program directions for DOE program managers to consider. This method of technical review has evolved over the past 5 years with participation by several hundred industry, academic, and laboratory researchers.

Recent accomplishments include technology assessments of fuel cell research, wind turbodynamics, nonhighway transportation, and light water reactor automation. A comprehensive review of the low level radioactive waste technologies was also accomplished resulting in recommendations for future research and development. A program assessment of the Oak Ridge National Laboratory's exploratory fund program, which reflects a broadly supportive program for new and innovative research ideas, is ready for publication.

The success of this exploratory fund program is one of the reasons for my support of such activities.

In the area of acid rain, the Office of Program Analysis continues to represent DOE on the Interagency Task Force on Acid Precipitation. This Task Force plans, coordinates, assesses and establishes the budgets for all Federal acid rain research. Peer reviews of the research into materials damage caused by acid rain have been held recently, resulting in directions for future research to clearly establish any deleterious effects of acid rain. These and other assessments are focusing on 1987 as a key year for identifying and quantifying acid rain impacts. The Energy Research Analysis program has been instrumental in bringing research to bear on this and similar issues. In addition, a National Laboratory Consortium mandated by the Energy Security Act of 1980 (P.L. 96-294) (ESA), composed of four National laboratories (Brookhaven, Argonne, Pacific Northwest, and Oak Ridge), is carrying out the comprehensive multi-year research effort provided for under section 704 of ESA to explain the impacts of acid rain, in addition to their roles as Task Force members.

The FY 1987 budget request for the Energy Research Analysis program is $3.5 million. It provides for (1) one to two independent analyses of the accomplishments of DOE R&D programs, (2) two to three assessments of technologies, (3) support for assessment and coordination elements within the National Acid Precipitation Assessment Program (NAPAP), including DOE's share of the support for the NAPAP Director of Research, (4) support of groups such as the Energy Research Advisory Board (ERAB) and JASON, and (5) technical support on issue papers and alternative action studies.

UNIVERSITY RESEARCH SUPPORT

The goal of the University Research Support (URS) program is to help maintain strong scientific/technical research capabilities in support of the Department's long-range energy R&D mission. To accomplish this goal, the URS program provides a special Departmental focus for a number of efforts which primarily involve universities and university faculty and students, both directly and in conjunction with the Department's National laboratories. The goals of these interrelated efforts are to:

- Maintain and strengthen university-based energy research and manpower development capabilities in selected high priority energy research fields.
- Use the unique resources of the National laboratories (equipment, instrumentation and personnel) to assist in university faculty and student research manpower development.
- Assist in the transfer of laboratory-developed technology and expertise to the university and private sector.
- Increase the number and enhance the quality of students, including women and minorities, pursuing professional level degrees in energy-related science and engineering.
- Help strengthen the scientific/technical workforce in the Department's National laboratories.

With an FY 1987 budget request of $11.0 million in Operating Expenses, the URS program consists of two major subprograms (Table 13). The first of these is the University/Laboratory Research subprogram, with a FY 1987 Operating Expenses budget request of $9.7 million. This subprogram supports both the University/Laboratory Cooperative Research and University Reactor Fuel Assistance efforts. One of the objectives of the Laboratory Cooperative Research activity is to enhance the quality of students pursuing future careers in science or engineering by involving them in ongoing laboratory research programs. This approach offers the added benefit of making additional research capabilities available to participating university faculty. The second subprogram is Energy Manpower Development with an FY 1987 Operating Expenses request of $1.3 million. This subprogram combines two manpower-oriented activities. The Manpower Assessment activity conducts assessments and analyses of the supply and demand of manpower for both current and future energy R&D programs. The Energy Education and Training activity supports projects directed at encouraging secondary school students to pursue energy-related science and engineering programs at the college level.

Table 13
University Research Support
Budget Authority
($ in millions)

	FY 1985	FY 1986		FY 1987
	Conf. Approp.	Conf. Approp.	Adjusted	Request
Operating Expenses				
University Laboratory Research				
University Laboratory Cooperative Research	$ 6.5	$ 6.0	$ 5.8	$ 7.8
University Research Fuel Assistance	2.8	3.9	3.7	1.9
Subtotal	$ 9.3	$ 9.9	$ 9.5	$ 9.7
Energy Manpower Development				
Energy Manpower Assessment	0.5	0.4	0.4	0.5
Energy Education & Training	0.3	0.4	0.4	0.8
Subtotal	0.8	0.8	0.8	1.3
Total University Research Support	$10.1	$10.7	$10.3	$11.0

The FY 1987 budget request for the URS program specifically includes: (1) support for approximately 2500 student and faculty research participation appointments and special training appointments at the Department's labs and major contractors; (2) support for joint research and manpower development efforts involving the DOE laboratories and Historically Black Colleges and Universities; (3) support for 20 Prefreshman Engineering Program Projects that will reach over 2500 junior and senior high school students, and for high school science student institutes at selected DOE laboratories; (4) cost-shared support for 30 visiting industrial scientists through the joint DOE National Laboratory-Industry Technology Transfer Exchange Research Program; (5) updated manpower assessments for future professional level manpower requirements (e.g., scientists and engineers) for DOE research programs; and (6) refueling of 7 university reactors and approximately 20 reactor sharing grants to be made on a competitive basis. This latter activity falls under the University Reactor Fuel Assistance program which provides fuel for university research and training reactors. The National nuclear reactor and manpower development effort is highly dependent on these specialized facilities not only for nuclear-related training but also for research in the basic sciences.

UNIVERSITY RESEARCH INSTRUMENTATION

Direct access to state-of-the-art scientific research instrumentation equipment is essential for continued progress in advanced, energy-related scientific and technical research. For example, frontier-level materials research in surface science and catalysis requires the ability to describe what is occurring at atomic and molecular levels. This research is essential for understanding such phenomena as carbon gasification, and the composition of surface gases. Instruments used in this research must be able to detect and identify materials at the parts per billion level.

Another example is in the field of biological energy research where a major limitation is in understanding the key proteins which influence physiological and genetic factors related to plant productivity. Advances in the analytical capacity of mass spectrometry now offer biological scientists possibilities for approaching this problem.

Many university scientists do not have direct access to sophisticated, state-of-the-art scientific research instrumentation. This is a serious National problem which is being addressed through the combined efforts of Federal science agencies, state governments, private industry and by the university community itself. The Federal effort is coordinated by the Office of Science and Technology Policy through the Interagency Committee on University Research Instrumentation chaired by the Deputy Director of the National Science Foundation. Each participating Federal agency is responsible for supporting university research instrumentation in relation to agency missions and programmatic needs. The DOE response to this overall National effort is the University Research Instrumentation Program initiated in FY 1984 to help support the purchase on a competitive basis by university researchers of state-of-the-art instrumentation.

The FY 1987 request for the University Research Instrumentation program is $5.0 million. This level will support an estimated 15 to 18 competitively selected awards for instrumentation costing over $100,000. Typical instruments supported in prior years include microprobes, electron and scanning microscopes, laser systems and spectrometers. As in prior years, the program will concentrate on those university research groups which have already demonstrated expertise in one of a small number of high priority energy-related topics which are of special concern to the Department's research programs. Among the research topics to be considered in FY 1987 are catalysis, bioconversion, engineering research including materials, the geological sciences, and environmental research. Each award will be cost-shared with the selected university.

MULTIPROGRAM ENERGY LABORATORIES-FACILITIES SUPPORT

The FY 1987 request for the Multiprogram Energy Laboratories-Facilities Support (MEL-FS) program is $60.2 million (Table 14). The MEL-FS program consists of two subprograms: Multiprogram Energy Laboratories-General Purpose Facilities (MEL-GPF), initiated in FY 1981, and Environmental Compliance, initiated in FY 1985. The goal of the MEL-GPF subprogram, which is managed for the Department by the Office of Energy Research, is to rehabilitate and replace multiprogram general support facilities that are essential to continued operations of the Department's multiprogram laboratory sites. These support facilities include site utilities and support buildings such as laboratories, office buildings and warehouses, roads and railroads, which represent a multibillion dollar Government investment.

Table 14
Multiprogram Energy Laboratories-Facilities Support
Budget Authority
($ in millions)

	FY 1985	FY 1986		FY 1987
	Conf. Approp.	Conf. Approp.	Adjusted	Request
Operating Expenses				
Environmental Compliance	$ 0	$10.4	$ 9.3	$14.3
Capital Equipment				
Environmental Compliance	0	1.0	1.0	1.0
Construction				
Multiprogram Energy General Purpose Facilities	33.2	23.7	22.8	34.9
Environmental Compliance	0	7.0	6.7	10.0
Total MEL-FS	$33.2*	$42.1	$39.8	$60.2

*A reprogramming, approved in April 1985, transferred $5.4 million to this activity.

Through continued use and aging, support facilities deteriorate to a point where they are no longer capable of performing their intended functions and must be rehabilitated or replaced. The

MEL-GPF program systematically reduces the backlog of deficiencies of these support facilities. It reflects an appropriate Federal responsibility for management of the Government's real property, and we plan to continue the program as a necessary cost of doing business as long as the multiprogram laboratory facilities are used to perform research and development functions for the Department.

The FY 1987 Construction budget request for MEL-GPF is $34.9 million (Table 15) and would continue construction on projects begun in prior years, including chilled water facilities at Brookhaven, Oak Ridge and Argonne National Laboratories, replacement of laboratory roofs at Argonne National Laboratory, a fire alarm system at Richland, and fire protection improvements at Brookhaven.

Table 15
Multiprogram Energy Laboratories-General Purpose Facilities (MEL-GPF)
Budget Authority
($ in millions)

Construction	TEC	FY 1987 Request
New Projects		
Buildings		
Laboratory Restoration I, PNL (87-R-751)	$ 2.1	$ 2.1
Piping System Restoration, ORNL (87-R-752)	3.8	0.7
Rehabilitate, Laboratory Space (87-R-753) (Building 200), ANL	12.0	1.2
Utilities		
Mechanical Systems Rehabilitation, ANL (87-R-755)	3.2	1.1
Waterline Replacement, ANL (87-R-756)	5.2	1.0
Electrical System Rehabilitation, LBL (87-R-757)	2.6	0.3
Rehabilitate Mechanical Utilities, LBL (87-R-758)	5.5	1.1
Upgrade Steam Distribution System, ORNL (87-R-759)	6.8	2.0
Subtotal New Projects		$ 9.5
Prior Year Ongoing Projects		
Fire Protection Improvements, BNL (86-R-726)	$ 3.0	$ 2.5
Central Chilled Water Facility, BNL (85-R-701)	15.0	5.7
Replace Laboratory Roofs, ANL (85-R-702)	9.8	2.4
Electrical Distribution System Restoration, ORNL (85-R-703)	2.2	1.4
Medical Facility Replacement, LLNL (85-R-706)	7.3	4.0
Replace Site Fire Alarm System, RL (85-R-707)	4.8	1.2
Establish a Central Chilled Water Plant, ANL (85-R-709)	5.2	3.6
Modify Central Chilled Water Plant, ORNL (85-R-712)	4.7	2.6
Road Repairs, RL, LBL, INEL, ANL (84-ER-103)	19.2	2.0
Subtotal Ongoing Projects		$25.4
Total Multiprogram Energy Laboratories - General Purpose Facilities		$34.9

The FY 1987 request includes eight new projects including laboratory restoration at Pacific Northwest Laboratory, piping system restoration and steam distribution system upgrade at Oak Ridge National Laboratory, rehabilitation of laboratory space and waterline replacement at Argonne National Laboratory, mechanical systems rehabilitation at Argonne and Lawrence Berkeley Laboratories and electrical system rehabilitation at Argonne National Laboratory.

Environmental Compliance is a separate subprogram because of the magnitude of the requirements at Oak Ridge National Laboratory. As such, it will identify and correct deficiencies at ORNL to ensure compliance with existing state and Federal regulations. Over the years, ORNL has generated a variety of radioactive and nonradioactive pollutants which were handled in accordance with existing environmental regulations. Since that time, a number of new regulatory requirements have resulted in the application of more stringent environmental criteria. As a result, long-established procedures and approaches to handling hazardous wastes are no longer acceptable.

The Department is currently working to fully determine the actions necessary to bring ORNL into compliance with all applicable regulations. The Environmental Compliance FY 1987 budget request of $25.3 million will allow initiation of activities to correct environmental deficiencies at ORNL. The Operating Expenses request of $14.3 million will allow initial activities in the following areas: process waste system upgrades, hazardous and toxic material management improvements; characterization of hazardous and radioactive wastes; determination of potential for ground water contamination in spill sites, holding ponds and White Oak Creek watershed; and upgrades of sanitary and storm sewers. The Capital Equipment request of $1.0 million is for equipment necessary to provide for the cleanup activities. In addition,

$3.0 million is for general plant projects (e.g., upgrade of the process waste collection system; goundwater monitoring network, etc.) and $7.0 million is for the Non-radiological Process Waste Treatment Project.

ADVISORY AND OVERSIGHT PROGRAM DIRECTION AND POLICY AND MANAGEMENT

The FY 1987 budget request for Advisory and Oversight Program Direction is $2.9 million. The FY 1987 request will provide the staffing resources required by the Director of Energy Research to carry out his responsibilities under legislation (P.L. 95-91) and those assigned or delegated by the Secretary in areas beyond the scope of other ongoing Energy Research programs. These funds are required to provide for the salaries, benefits, travel and other expenses associated with 44 full-time equivalents.

The FY 1987 budget request for Policy and Management is $0.5 million. These funds are required to provide for the salaries and related expenses associated with 8 full-time equivalents in the Office of the Director of Energy Research.

Mr. Chairman, that concludes my testimony. I would be happy to answer any questions.

BIOGRAPHICAL SKETCH

ALVIN W. TRIVELPIECE

Dr. Alvin W. Trivelpiece was nominated by the President on July 8, 1981, and confirmed by the Senate on July 27, 1981, as Director of the Office of Energy Research, U.S. Department of Energy (DOE). In this position, Dr. Trivelpiece serves as technical adviser to the Secretary on the Department's energy research and development programs and is responsible for the multipurpose laboratories and energy education and training activities. In addition, he manages DOE's programs for basic energy research, health and environmental research, high energy and nuclear physics, and magnetic fusion.

Dr. Trivelpiece has extensive experience in the areas of plasma physics and fusion research. From 1978 until assuming his current position, Dr. Trivelpiece was Corporate Vice President of Science Applications, Inc., of La Jolla, California, primarily responsible for internal research programs relative to innovative technical developments. From 1976 to 1978, he was Vice President for Engineering and Research at Maxwell Laboratories, San Diego, California.

During the period 1973 to 1975, Dr. Trivelpiece served with the U.S. Atomic Energy Commission as Assistant Director for Research in the Division of Controlled Thermonuclear Research. Prior to joining the Federal Government, he was Professor of Physics at the University of Maryland, serving in that capacity from 1966 to 1976. From 1959 to 1966, he was a professor at the University of California at Berkeley in the Department of Electrical Engineering.

He received a B.S. degree from California Polytechnic State University in 1953, an M.S. degree in 1955, and a Ph.D. degree in 1958. Both advanced degrees were awarded by the California Institute of Technology.

The recipient of several honors and awards, Dr. Trivelpiece is listed in American Men and Women of Science, Who's Who in America, and Who's Who in the World. He holds several patents in the area of physics research and is the author and coauthor of over 100 technical reports and books. Dr. Trivelpiece is a member of numerous professional organizations and is a Fellow of the American Physical Society, the Institute of Electronics and Electrical Engineers, and the American Association for the Advancement of Science. He has served as a consultant to various private associations and Government agencies and has lectured at conferences and universities throughout the United States and abroad.

Dr. Trivelpiece was born in Stockton, California. He is married and has three children.

June 1983

SUPERCONDUCTING SUPER COLLIDER

Chairman HATFIELD. Thank you, Dr. Trivelpiece.

Let me go back and sort of have you highlight, again, the activity of the SSC, since there seems to be a great deal of public interest in that throughout the country and also in my State.

Again, how much is the figure that you request for fiscal year 1987 for continued R&D on the SSC?

Dr. TRIVELPIECE. No amount is specified at the moment on the fiscal year 1987 budget for that activity. The reasons for this, in part, stem from the Gramm-Rudman activities, although I won't blame it on that specifically.

What happened is, in effect, that two new facilities have come on line, the Stanford linear collider and the Tevatron I facility at Fermilab. Both of these have budget requests that are consistent with getting the facility operating for the first time. We were stuck with the problem of reducing the amount, perhaps, that might be devoted to research and development on the SSC next year. So rather than spelling that out in the budget, we decided that we would move ahead by 1 year the time in which we would try to seek a decision to go ahead for the selection.

Approximately 80 to 90 percent of the information is now available. We have a site criteria document; the conceptual design report is in the process of its final preparation, we have done the magnet designs, selected a magnet, decided on a 52-mile circumference and a number of things. They are all done now.

We are going to present this to Secretary Herrington and go through the science and technology, the feasibility, the costs, the schedule, with the objective of seeking to have him make a decision on a fiscal year 1988 construction start.

Now, if we start the construction in fiscal year 1988, the things that we do in fiscal year 1987 are different than if, for instance, he decides not to ask for this funding from the President, in which case, then, we would have to do something different.

So, it is a question of the activities. We wouldn't necessarily be proposing any supplementals. It is just that the collection of activities that needs to be done is different, depending on the outcome of the Secretary's decision, and at the time that we had originally prepared our budget, the Gramm-Rudman-Holling's bill had not yet passed, and so there were some things that changed in the course of our final budget preparation before the President's budget was sent up here.

Chairman HATFIELD. Dr. Trivelpiece, as much as I oppose Gramm-Rudman, and voted against it, consider it an idea whose time had not come for whatever reason, we really can't blame on the Gramm-Rudman the budgetary process up to this point. Let me ask you, did you make a request for funding at the $20 million, your current level or some other level to OMB, or did you not make a request for that?

Dr. TRIVELPIECE. Yes; there was a request, I think, of $30 million.

Chairman HATFIELD. Of how much?

Dr. Trivelpiece. $30 million.

Chairman Hatfield. $30 million. So the program was, in effect, excised as a result of consultation with the OMB?

Dr. Trivelpiece. I want to make it clear that this does not reflect a shift in the administration's position with regard to this program. The only thing that has happened is that we have moved forward by 1 year the time in which we would seek to make a go-no go decision on the construction. That is perhaps, an inconvenience. I would have preferred to have waited 1 more year of gathering R&D information without necessarily going forward to seek a go-no go decision.

But we weren't able to, in the budgetary constraints within which we were forced to live, able to make a commitment of $30 million, and I was reluctant to see an amount of, say, $5 million in there, in which case we would have had to say we were terminating the project.

Either of those levels carries with it a certain message. So we are trying to avoid specifically making any particular message and just saying that we are going to conduct this review, the Secretary has an open mind on the subject, and we will decide to proceed in 1988 or not, and if we do, then perhaps it does take $30 million. If we decide not to proceed and it takes some other amount, or it may be that we can say he doesn't think that we are ready in 1988, and go on to 1989, and then a different amount would be required.

In all cases, it is an amount, it is the collection of activities that would have to be done, not necessarily the total amount of funding requested for the whole High Energy Physics Program that would need to change.

PROJECT REVIEW PROCESS

Chairman Hatfield. I had the impression that this in-depth review would be completed, perhaps by this summer.

Dr. Trivelpiece. My hope is that it will be completed some time early enough in the summer to permit us to factor the Secretary's decisions into our fiscal year 1988 planning and give him time to, should he want to do so, discuss the matter with the President before the next year's budget is prepared.

A $6 billion item like this shouldn't be sent over from the Department to OMB and surprise anyone. I think the Secretary will undoubtedly want to discuss this with the President.

Chairman Hatfield. What would be the next normal step if your in-depth review should indicate to move to the next step? What would be your normal next step, construction?

Dr. Trivelpiece. No; I think the normal next step would be that it might—all this is hypothetical—it would appear in the 1988 budget. So next year at this time, we might be discussing this subject. If it were in the budget, then we would propose to wait until after these hearings are completed to go forward to the site selection request.

Chairman Hatfield. I get the very strong signal you are giving me on the matter that you don't plan to do anything until the 1988 budget.

Dr. TRIVELPIECE. No; I am trying to avoid doing that. I am trying to say that there are things that need to be done in the fiscal year 1987 budget.

Chairman HATFIELD. Without funding?

Dr. TRIVELPIECE. It depends on whether or not the Secretary believes that we ought to proceed with this project, and there are at least four different alternatives to choose from: no, never; not in fiscal year 1988; yes in 1989; yes, in fiscal year 1988.

Chairman HATFIELD. Let's take the most immediate action. Let's play through a scenario. I am trying to find out where your secret fund is. [Laughter.]

FISCAL YEAR 1987 FUNDING POSSIBILITIES

If the Secretary should say, "Dr. Trivelpiece, full steam ahead," what would you do? Where would you get the funds?

Dr. TRIVELPIECE. I don't believe that it would be necessary to ask for any additional funding than that which is already in the fiscal year 1987 High Energy Physics Program budget.

Chairman HATFIELD. How much is in there?

Dr. TRIVELPIECE. Well, for generic activities which involve magnets and other things not necessarily SSC-related, there is about $90 million. This is an amount which is included——

Chairman HATFIELD. Did you say $19 million?

Dr. TRIVELPIECE. $90 million.

Chairman HATFIELD. In other words, you have an unobligated account here of funds that are available that you can move around as you want. [Laughter.]

Dr. TRIVELPIECE. Absolutely not, let the record show, please.

Chairman HATFIELD. All right. [Laughter.]

I am just trying to determine where you are going to get the money for the SSC or how much of that $90 million is SSC related..

Dr. TRIVELPIECE. There is a collection of activities that we need to be doing in the course of building magnets, designing them, testing them, that is both related to the SSC and is unrelated to the SSC.

Somewhere down the line, other accelerator facilities are going to be needed, for which these kinds of magnets are generic.

The kind of work that would go on would change in emphasis, and we would, modify some of the ongoing programs at the laboratories in such a way as to emphasize things that are SSC-related versus things that are not, but that is within the definition of that appropriation account, things that we change on a yearly basis, anyway.

Chairman HATFIELD. And you say there is $90 million of potential resource budgeted to fund whatever action that you might determine should be the next step following your in-depth review?

Dr. TRIVELPIECE. Yes; you could think of it as a reprogramming, but I believe that it is within the limits of things for which a specific congressional reprogramming request would not be necessary in that it is allowed within that appropriation account to conduct these activities.

Chairman HATFIELD. Well, if you run into problems in carrying out the review schedule that you have outlined—a schedule that I am not quite sure I understand—please don't hesitate in asking for help in reprogramming the funds included in the budget. [Laughter.]

I understand that procedure.

Dr. TRIVELPIECE. That is why I stated in my opening remarks that we will keep you informed as we proceed through this process.

Chairman HATFIELD. I have a very sadistic recommendation here by staff that I will not pursue. [Laughter.]

I am tempted, however. [Laughter.]

I will resist the temptation.

Dr. TRIVELPIECE. I suppose you will pursue it with me later. [Laughter.]

Mr. Chairman, I would like to provide for the record an explanation of the activities conducted under the high energy technology subprograms and how they relate to the SSC, as well as other advanced accelerator concepts.

[The information follows:]

HIGH ENERGY TECHNOLOGY R&D

The fiscal year 1987 President's budget request includes $95.5 million for high energy technology. This subparagraph supports a broad spectrum of advanced accelerator and detector R&D studies. The SSC R&D activities have been funded within the advanced accelerator R&D part of this subprogram. The advanced accelerator R&D program includes studies to devise means to enhance scientific performance, operating reliability, and cost effectiveness of existing facilities; studies related to ongoing major projects such as Tevatron I, SLC, and the AGS accumulator booster; and studies of advanced accelerator concepts and technologies.

Technical subjects which are the focus of advanced accelerator R&D include advanced magnet development with particular emphasis on superconducting magnets for a broad range of applications including the SSC; topics in accelerator physics including the theory of magnetic optical systems, both linear and nonlinear; studies of beam dynamics in linear accelerators, circular accelerators, storage rings, and charged particle beam transport systems; studies of advanced radio frequency power sources and accelerating structures including klystrons, lasertrons, gyroklystrons, and free electron lasers; new and innovative advanced accelerator concepts include laser and plasma-driven beat wave accelerators, wakefield accelerators, laser grating accelerators, collective effect accelerators, and the inverse free electron laser accelerator.

In the area of facility R&D, advanced technology R&D supports work on improved beam target technology; improved secondary support work on improved beam target technology; improved secondary particle beam transport systems; new and improved detector technology such as liquid argon time projection chambers, solid state microvertex detectors, and ring imaging Cherenkov detectors; and advanced data processing systems including the use of computation "farms," development of standardized electron instrumentation systems (e.g., Fastbus), and hardware and software for parallel data processing.

If we proceed with SSC construction in fiscal year 1988, it would be possible to accommodate SSC R&D within the high energy technology request in fiscal year 1987 by concentrating on highest priority tasks, perhaps with some reduction of other technology R&D. If we decide not to proceed with SSC, it is still essential to provide new forefront research capabilities for the High Energy Physics Program by about the mid-1990's and a hadron collider using superconducting magnets is the only feasible way to achieve this goal. Thus, there will be a need for continued superconducting magnet R&D in fiscal year 1987 even if the specific focus on SSC is discontinued.

SSC SITING

Chairman HATFIELD. As you probably know, we have some rather enthusiastic constituents in Oregon that are interested in this project. When do you expect that site criteria might be developed so interested groups can nail down a little more precisely whether they might be qualified for further consideration?

Dr. TRIVELPIECE. Yes; we do have a site criteria document which has been prepared. I have made copies available to all the Governors of the States.

We have received some comments back from them. I don't believe the site criteria is likely to change very much, although it is presumably merely a draft document at this point and has not been approved by the Department and is not part of any official proposal submission request.

Chairman HATFIELD. But you feel that it is specific enough to be able to winnow out, obviously, unqualified areas as site possibilities?

Dr. TRIVELPIECE. Yes; I believe so.

Chairman HATFIELD. We have three excellent potential sites in our State. [Laughter.]

Dr. TRIVELPIECE. I am aware of the interest of the constituents of your State in this matter, Mr. Chairman.

Senator DOMENICI. How about mine? [Laughter.]

Chairman HATFIELD. The Senator from New Mexico is out of order. [Laughter.]

The line forms right here. [Laughter.]

Dr. TRIVELPIECE. I think by last count, there are only eight States from which we haven't heard.

Chairman HATFIELD. Only eight States.

Dr. TRIVELPIECE. That we have not heard from.

Chairman HATFIELD. Good. [Laughter.]

When the site selection is made, then only one State will be interested from then on.

Dr. TRIVELPIECE. I suspect.

Chairman HATFIELD. And that State ought to have some place in the hierarchy of the Congress, where they can implement that selection. [Laughter.]

Senator DOMENICI. Are you suggesting there is only one such source? [Laughter.]

Chairman HATFIELD. There is only one committee where this money will be provided. [Laughter.]

MAGNETIC FUSION ENERGY

PRODUCTION OF SPECIAL NUCLEAR MATERIALS

Dr. Trivelpiece, I would like to turn now, momentarily, to the Magnetic Fusion Program.

I have a copy of a letter dated February 10, 1986, addressed to the Honorable Joseph S. Salgado from Donald A. Hicks from the Department of Defense. Of course, I am sure you are familiar with this letter. It refers to a research project initiated by you relating to magnetic fusion as a means of producing special materials for nuclear weapons in the future. For years, my understanding of the magnetic fusion program has been that the first fusion reactor would not be a breeder of nuclear materials. Of course, the focus has been upon producing energy.

I understand now that a study is proposed to look at using magnetic fusion to produce special nuclear materials used for nuclear bombs and warheads. Would you comment on this study? Also, do you see this military application as a near-term use of magnetic fusion rather than, say, using it to generate electricity? How much do you propose to spend on this effort in fiscal years 1986–87?

Dr. TRIVELPIECE. The last question first, we don't propose to spend anything on that activity. There have been a number of studies that have been done by various companies and scientists on this subject, both in the United States and outside the United States, on what you might do with the neutrons from the fusion reaction once you have successfully made fusion work. These range from producing fuel for fission reactors to breeding tritium.

There are a large number of these studies. There are many proponents for them. What I decided to do was to ask the National Academy of Sciences to look into these various studies and make some comparison of them and advise me as to what they thought of them from a scientific point of view, a technical point of view, and so on.

There is no escaping the physics fact that fusion neutrons can be used to make various kinds of bred fissile atoms, which range all the way from plutonium to tritium and quite a few things in between. Whether or not this does it in a cost effective and energy effective manner I think is a subject of a lot of engineering design work, and whether or not this particular utilization of fusion reaction would be something that would occur sooner than or at the same time or later than other civilian applications, I think, would depend on the emphasis that was put onto it and the purpose to which it was put.

But I think it is something which is not ignorable from the physics point of view. Those were the facts, it can be done; and the question is whether or not that should be the direction or the technology that would be emphasized is a question that comes in another arena.

Chairman HATFIELD. Do I hear you saying, then, that there is not necessarily a major shift in the Department's program on magnetic fusion as much as it is a possibility of this becoming a secondary or preferable benefit that might come to the military vis-a-vis your ongoing program?

Dr. TRIVELPIECE. I think that is the thrust of Dr. Hick's letter, and I think it was based on a report that had been done by some people at Livermore that point out certain advantages if the fusion reaction is going to work in a certain way, that that compared technically with a new production reactor, has certain advantages in the tritium arena. It is a matter of cost and cost effectiveness as to which of those is a more important thing to do.

But there is no shift in the Department's program or emphasis of this activity at this time.

Chairman HATFIELD. If a shift should be contemplated in the future, I would hope that this committee would be informed before that decision is made.

Dr. TRIVELPIECE. You may count on it.

Chairman HATFIELD. The Senator from New Mexico?

Senator DOMENICI. Thank you very much, Mr. Chairman.

Mr. Chairman, I was delayed, and consequently, I did not get here in time to inquire of Assistant Secretary Fitzpatrick. I have two or three questions.

PROPOSED DEFERRALS FOR 1986

Senator DOMENICI. Secretary Fitzpatrick, it is my understanding that in the 1987 budget request, DOE proposed several deferrals. I understand they may amount to about $1.6 billion, some of which would terminate programs. Many of these funds were added by Congress and weren't in your original budget, the administration budget.

Then I understand that in February of this year, Secretary Herrington changed some of those and informed the chairman of the subcommittee that certain deferrals for six university projects would be revised to rescissions. I don't know whether the six have some extraordinary characteristics, but I wonder how that kind of decision was made, especially since all projects and universities weren't treated that way. I have one at New Mexico State University, a small one, $450,000 for a solar project. I think it is a good one. It received a national award as the best United States demonstration program, according to the expert group that researched it, as to the efficacy of different programs.

Do you have any knowledge as to what criteria were used to change the six from deferrals to rescissions and leave others as deferrals?

Ms. Fitzpatrick. No; I don't, Senator.

Excuse me. The one thing that I do know is that I think those six involve construction projects. The one that I know about specifically that is under my purview is a construction project.

Senator DOMENICI. Would you look into that?

Miss FITZPATRICK. Yes; certainly.

Senator DOMENICI. And let us know, please?

Miss FITZPATRICK. Yes.

[The information follows:]

SOUTHWEST RESIDENTIAL DEMONSTRATION PROJECT

Unlike the six university projects in the Basic Energy Sciences Program which are being reclassified as rescissions, the renewable energy Southwest residential demonstration project is not a construction project. Rather, the project involves the operation and monitoring of photovoltaic arrays under the direction of the New Mexico Energy Research Institute. Although the project is associated with New Mexico State University, it is not considered to be a university program.

FUEL CELLS

Senator DOMENICI. On another subject, you also seemed to be rather enthusiastic, from what you have said and testified in the past, about the Fuel Cell Program on Transportation. But your budget request, nonetheless, has reduced all fuel cell programs drastically. I am concerned that when we add some money for a program like that you seem to be able to get by without having to spend it and without very much justification.

If you want me to be a little more specific, I guess I would just like to know, under Gramm-Rudman-Hollings, where that is defined as a project, program, or activity, how could an entire program like the fuel cells for $34 million be wiped out? Do you have any idea?

Miss FITZPATRICK. Senator, I think that is an Office of Fossil Energy Program at that level, because the Office of Renewable Energy has never had a fuel cells program of that amount. So I could get you that information, though I can't comment on it myself.

Senator DOMENICI. Then you are only saying that that doesn't come within your particular authority? But nonetheless, the question seems to me to be somewhat relevant. How can you have an across-the-board 4.3-percent cut and then cut a program in its entirety to the tune of $34 million? Unless that was discretionary, it would seem to me that program would have to be about 30 times as large as $34 million in order to get $34 million off the program.

Could you find out how that happened?

Miss FITZPATRICK. Yes, Senator, I would be glad to.

Senator DOMENICI. I am not saying that within the Gramm-Rudman-Hollings project program and activity definition that that is not possible. It appears to me to be very, very unique, but it could be; it could be that within a program, all you had to do was cut 4.3 percent, and it might be that, the way it was appropriated, had a whole batch in as a program, and so you pick one. I think that is clearly permitted, if that is the case. But would you tell us about that, please?

Miss FITZPATRICK. I certainly will, Senator.

[The information follows:]

RATIONALE FOR MAJOR REDUCTION TO FUEL CELL FUNDING CONNECTION BETWEEN THIS FUNDING RECOMMENDATION AND GRAMM-RUDMAN-HOLLINGS

In order to achieve the Gramm-Rudman-Hollings reductions that are necessary to reduce the deficit, a 4.3-percent reduction for fiscal year 1986 was a first step. To meet the total Gramm-Rudman-Hollings target of $144 billion for fiscal year 1987, the Department proposed spending cuts in its fiscal year 1987 budget request, as well as deferred a majority of the congressional add-ons in the fiscal year 1986 appropriations bill which would also impact Federal expenditures in fiscal year 1987. The add-ons for fossil energy were deferred in order to reduce budget outlays in both fiscal year 1986 and fiscal year 1987. These deferrals are to be used to offset fiscal year 1987 appropriation requirements.

Of the $35.4 million appropriated in fiscal year 1986 for the Fuel Cells Program, the Department has deferred $11.6 million, including $6.8 million for phosphoric acid systems, $3.8 million for molten carbonate systems, and $1.0 million for advanced concepts. In addition, $9.3 million of phosphoric acid systems fiscal year 1986 appropriations for the 7.5 MW technology development is proposed for rescission instead of being deferred as previously reported. The majority of the deferrals and the rescission is related to phosphoric acid fuel cells [PAFC]. In the PAFC Program, the Department is continuing development of the 11 MW stack configuration A with the International Fuel Cells Corp. [IFC] in fiscal year 1986 and fiscal year 1987 utilizing existing funds. In addition, the competitive procurement for configuration B cell stack R&D will be funded using fiscal year 1985 unobligated funds. For the Molten Carbonate Program, the IFC contract for external reforming is funded to completion using fiscal year 1986 funding. The Energy Research Corp.'s direct fuel cell project is funded through the current contract period (Sept. 30, 1986) using fiscal year 1985 funds. In addition, a competitive procurement will be issued in late fiscal year 1986 to continue development of external and/or internal reforming molten carbonate stacks using fiscal year 1986 funds and technology development continued into fiscal year 1987 using fiscal year 1987 funds.

The Department believes PAFC technology has, as a result of technology developments and demonstrations, reached a maturity level such that the private sector can now continue the final development work and commercialization. As a result, the Department did not propose continuing PAFC development in fiscal year 1987 because of its mature state, but proposes to continue molten carbonate systems development and solid oxide research at a reduced level.

MAGNETIC FUSION

Senator DOMENICI. For Mr. Trivelpiece, with reference to magnetic fusion—and maybe you answered this for the chairman. That program, in your recommendation, is down to $333 million. I understand that is from $365 million.

Dr. TRIVELPIECE. Yes.

Senator DOMENICI. Will that $333 million maintain the effort in those very key technical areas so that we have an effective program, particularly in advanced fusion concept programs that you told us you intend to maintain?

Dr. TRIVELPIECE. I believe so. It is a difficult adjustment to have to make, but I believe we have made the adjustment in a way to preserve the correct elements in the program.

SUPERCONDUCTING SUPER COLLIDER

Senator DOMENICI. On the SSC, which the chairman inquired of, again, if you discussed this with the chairman, I don't intend to duplicate the effort. But we have had some discussions in the past on international participation with the SSC.

Is it timely for you to at least bring the committee current on what the international possibilities for participation in the SSC are? Or is it too early for you to discuss it?

Dr. TRIVELPIECE. I would be glad to.

Of course, it is necessary to have something on the table to negotiate with, and until such time as the United States decides to proceed, there is a certain element of hypotheticalness to the whole thing. But I was in Japan a few weeks ago, and I met with one of the Japanese leaders of the High Energy Physics Program, and he informed me that the Japanese scientists in high energy physics have made a decision that if the United States were to proceed with the SSC, then that is the activity that they would like to find themselves joining with and participating in.

That doesn't put any money on the table, but it is certainly a step up, and that they have made a decision not to join with the Europeans in doing this.

I was also in Italy not too long back and was meeting with some of the representatives of the High Energy Physics Program there. I would think we might consider Italy as a potential partner in this area, too. The rest of Europe, I think, might be a little hard-pressed in that the Hera project Desy Lab is a very large commitment, and I think it is pretty much taking the resources of Germany and some other countries that are participating. Such is true in West Germany with the large electron-protron project. It is a very large commitment. For the foreseeable future, I can't imagine Europe, other than Italy, becoming heavily involved in this activity.

I think Japan is very promising, and I would be quite encouraged in their prospects of coming in if the United States decided to proceed.

Senator DOMENICI. In a nutshell, it is possible that a share of the costs that we have been hearing about for SSC may be borne by Japan and others if we proceed and if appropriate arrangements could be made to make their partial investment something that they saw as worthwhile, is that correct?

Dr. TRIVELPIECE. Yes; I think that is correct. It would be needed to be looked at in terms of the quid pro quo from their perspective and perhaps the use of assigning an interaction region to study the interactions. But until we are farther along, it is not possible to get into the specifics of the negotiations.

Senator DOMENICI. My last question on the SSC is: As I read about it and talked with people in my State, I was led to believe that many States and even subdivisions of States are involved in trying to qualify, and that there is some discussion in the air about locations offering local incentives of a monetary nature as part of their program.

Dr. TRIVELPIECE. You are correctly informed, Senator. [Laughter.]

Senator DOMENICI. Let me ask: I don't speak of the incentives of the type the chairman spoke of. That is part of the congressional activity, or even of that type that poor, little Senator Domenici might be talking about here. [Laughter.]

What I wanted to ask was whether or not the Department has made up its mind and has no criteria for siting that involves a bidding war between the locales as to how much local money they are going to put up. Does the Department have that?

Dr. TRIVELPIECE. That is correct. We have not come to a position on that matter.

Senator DOMENICI. I don't know what the chairman thinks about it, but I think the four criteria involving actual monetary bidding by cities or States for that becomes part of it.

Surely, Congress ought to have something to say about that, wouldn't you think, Mr. Chairman?

Chairman HATFIELD. I would think so, except I certainly wouldn't foreclose the possibility of free land, Federal Government land, that might be already available and titled to the Federal Government, such as in Oregon or New Mexico. [Laughter.]

Senator Domenici. Mr. Chairman, some locales are well beyond free land. I mean, you would think that Texas, which usually thinks big, is talking well beyond land. They are talking about land and millions of dollars they might make available to put up for a site.

I frankly believe it is not incumbent upon the administration to make that kind of a decision in isolation. We ought to surely have something to say about that.

From brief discussions with you, you told me in the past you don't have any such criteria, and if they are going to be developed, you would certainly furnish the ideas to Congress before you concluded in that regard, is that correct?

Dr. Trivelpiece. I think that is correct, Senator, yes.

Senator Domenici. I thank you very much.

PRICE-ANDERSON INDEMNIFICATION EXTENSION

Mr. Chairman, I had one other concern that Senator Johnston shared with me. I will be very quick with it.

It does have to do with a nonappropriations committee, the Energy Committee, upon which the chairman serves with Senator Johnston, myself, and Senator McClure.

We thought we ought to ask you to furnish this information which might be helpful to us as we work on Price-Anderson indemnification extension.

There are two bills that we have before us that would require:

> That the Secretary determine if any nuclear incident covered by an agreement of indemnification involved gross negligence or willful misconduct on the part of a DOE contractor, subcontractor, or supplier. The Secretary would be required to recover from such contractor to the extent that such negligence contributed to the incident.

We understand that you have, or may have, some agreements of indemnification with subcontractors that are operating at the national labs and any of these contractors, may be universities or consortia of universities.

I wonder if you would be able to provide the subcommittee with any typical such agreements as they pertain to indemnification? Senator Johnston and Senator McClure thought we should see that language as we work through that bill. If you could do that, we would appreciate it.

Also, if you could tell us when you submit them, in the amendment that we will provide to you with the suggested language, if it would have any impact on future contracts between the Department and universities, I think we ought to know that before we finish the legislation; and what options can you identify to permit continued access to the resources available at universities?

We will submit that language to you with those questions. Could you answer that and give us some typical indemnification language, if you have some?

Dr. TRIVELPIECE. Certainly, I hope you are not expecting me to do that at the moment, because I don't know all that information in my head.

Senator DOMENICI. No; I don't believe we are back in markup for 10 days, so at your convenience.

Dr. TRIVELPIECE. We will be pleased to prepare the information and provide it to the Senate Energy and Natural Resources Committee.

Senator DOMENICI. Thank you, Mr. Chairman.

Chairman HATFIELD. Thank you, Senator.

ENVIRONMENT, SAFETY, AND HEALTH

STATEMENT OF MARY L. WALKER, ASSISTANT SECRETARY FOR ENVIRONMENT, SAFETY, AND HEALTH, DEPARTMENT OF ENERGY

Chairman HATFIELD. This will be the first appearance of the new Assistant Secretary, Mary L. Walker, who comes to this position which she now occupies with great qualification and distinction, having been educated at UCLA and Boston University. She has served as an attorney for Southern Pacific Transportation Co. and with a very outstanding law firm in Los Angeles specializing in land use and environmental law.

She has been selected to assist the Attorney General of the United States in litigation of some 2,500 cases involving public land and other such matters involving the environment. She then moved over to the Interior Department, where she was Deputy Solicitor and one who, again, supervised other lawyers in areas of her expertise. Following her service at Interior she moved to the Department of Energy, first as a special consultant to the Secretary of Energy and now in this particular role, where she has advisory responsibilities over 260 nuclear reactors and some facilities. She is, indeed, eminently qualified, and we are happy to welcome her here today.

Your testimony will be placed in the record in full. If you wish to make a statement highlighting your testimony, we would be happy to hear it.

BUDGET REQUEST

Ms. WALKER. Thank you, Mr. Chairman, Senator Domenici.

I am pleased to be here today to discuss with you the Department's fiscal budget request for 1987 for the environment, safety, and health programs.

This program, including the Secretary's new initiatives in the form of the environmental survey and the technical safety appraisals and some other measures which accompany them, represent the Secretary's personal commitment to the environment and the safety of our workers and the public. The 1987 budget request is $76.1 million, which represents a $29.2 million increase over the fiscal 1986 level. This increase is principally for beginning work on the environmental survey, which we are proposing to fund at the level of $30 million for fiscal 1987.

I would be happy to answer any questions you might have.

[The statement follows:]

STATEMENT OF MARY L. WALKER

Mr. Chairman and Members of the Subcommittee, I am pleased to be here today to discuss with you the Department's budget request for FY 1987 for the Environment, Safety and Health Program. I am accompanied by Raymond Berube, Deputy Director, Office of Environmental Audit and Compliance, and Geoffrey Judge, Acting Director, Office of Budget and Administration.

NATIONAL ENERGY POLICY PLAN AND SAFE, ENVIRONMENTALLY SOUND OPERATION OF DOE ACTIVITIES

The overall goal of our national energy policy is to foster an adequate supply of energy at reasonable costs. The two strategies to achieve this goal are (1) to promote a balanced and mixed energy resource system and (2) to minimize federal control and involvement in energy markets while maintaining public health and safety and environmental quality. In addition, the Department is responsible for the manufacturing of nuclear weapons for national defense purposes. It is the stated policy of the Secretary of Energy to conduct all of the Department's operations in an environmentally safe and sound manner. Protection of the environment and the public are of paramount concern and importance to the Secretary and the Department.

GOAL OF OFFICE OF ENVIRONMENT, SAFETY AND HEALTH

The goal of the Environment, Safety and Health (ES&H) Program is to:

- assure conformance of the Department's activities with all applicable environmental laws and regulations and assure that the health and safety of workers and the public are protected;
- assure that national environmental protection goals are incorporated into the formulation and implementation of energy policy and programs;
- assure that environmental, safety and quality assurance concerns are identified, prioritized and addressed through corrective and remedial actions, and areas of environmental and safety risk are reduced to levels as low as practical;

- o develop policy options for the Department on the effects of National environmental policy and regulations on U.S. energy industries and energy supply and demand; and

- o provide liaison with other federal agencies, such as EPA, concerning regulatory efforts and specific actions of those agencies that may have an impact on DOE operations.

PRINCIPAL STATUTORY AUTHORITY

As its principal basis in law, the Environment, Safety and Health program responds directly to 19 statutory requirements which are listed and briefly summarized in our FY 1987 budget submission.

ENVIRONMENT, SAFETY AND HEALTH RECORD

Among the primary objectives of the ES&H program are the assurance of the safety and health of the public and the quality of the environment, the protection of Government properties against accidental loss and damage, and the assurance of safe and healthful work places and conditions of employment for both DOE and contractor employees at approximately 225 industrial and research sites across the United States involving both nuclear and non-nuclear operations.

The vital interest that the Department places on its safety and health program, and the positive results realized from that program are best illustrated by comparisons with the private sector. The following is a comparison summary of our FY 1985 safety and health record:

- o DOE's fatality rate of 1.2 deaths per 100,000 worker-years is approximately 10 percent of the private sector 1980-1984 average fatality rate reported by the National Safety Council.

- o DOE's recordable injury/illness rate of 2.2 cases per 200,000 work-hours is 33 percent of the private sector average rate for 1980-1984.

- o DOE's property loss rate of 0.44 cents per $100 property valuation is about 17 percent of the private sector experience rate.

- DOE's vehicle accident rate of 4.0 accidents per million vehicle miles is about 21 percent of the National Safety Council's five-year statistical average for 1980-84.

Without exception, for each year since its creation, the Department has carried out its operational missions with a safety and health record that is at least two-to-three times better with respect to fatalities, injuries, and illnesses, and more than ten times better with respect to property protection, than that of the private sector.

The increasingly complex and dynamic situation regarding environmental laws and regulations has required us to reevaluate our environmental programs. Some of our facilities have been in use for nearly 40 years and many of the environmental problems we are finding at DOE facilities represent a "legacy of the past," from activities conducted in a different atmosphere and under different standards than are applied for today's more sophisticated and highly publicized environmental and safety criteria. What was acceptable in 1945 is not acceptable in 1986.

NEW INITIATIVES IN ENVIRONMENT, SAFETY AND HEALTH

On September 18, 1985, Secretary Herrington announced a series of initiatives to strengthen the environment, safety and health function within the Department of Energy. These new initiatives are the result of a thorough review of the Department's environment, safety and health function by ES&H and senior management of the Department.

- First, oversight responsibility for the environment, safety and health function in the Department has been consolidated and upgraded under the new Assistant Secretary for Environment, Safety and Health. ES&H is now integrally involved in the operation of the Department at all levels, is directly overseeing the environmental and safety aspects of the Department's ongoing operations and necessary corrective actions, and is more integrally involved in decisions affecting those operations.

- Second, ES&H will conduct a baseline Environmental Survey of all DOE facilities to identify Department-wide existing environmental problems and areas of potential risk and to prioritize corrective action. The onsite Survey activities scheduled to begin in FY 1986 will take about 3 years to complete and will enable the Department to develop long-range planning for correcting environmental problems and reducing potential risks.

- Third, ES&H will conduct Technical Safety Appraisals of DOE's nuclear facilities to determine compliance with safety requirements, industry lessons learned, and licensed facility requirements. These will be on-site technical appraisals of all aspects of safety, including nuclear reactor safety, nuclear process facility safety, health physics, training, emergency preparedness, occupational medicine, occupational safety, fire protection safety, and transportation and packaging safety. The Technical Safety Appraisals, begun in February 1986, will also be completed in about 3 years.

Other elements of the Department's strengthened Environment, Safety and Health program include regular field reporting and a Computer Assisted Tracking System, a more aggressive ES&H role in the development and implementation of environmental and safety policies for the Department, including more detailed Resource Conservation and Recovery Act and Comprehensive Environmental Response, Compensation, and Liability Act (RCRA/CERCLA) policy guidance, enhanced liaison with State and Federal agencies, and coordination of Departmental environmental activities such as compliance with RCRA and CERCLA requirements.

The new initiatives represent the Secretary's personal commitment to a quality environment and to the safety and health of our workers and all Americans. These initiatives assure that the Department has solid information upon which to base its clean-up and corrective actions, and strong oversight to ensure continued safe and environmentally sound operations.

I would like to emphasize that none of the new ES&H initiatives described above are meant in any way to suggest that line management in the Department has a decreased responsibility for safety and environmental matters. Line management has the basic responsibility to conduct its activities in accordance with the Secretary's environment, safety, health and quality assurance policies. The fact that ES&H is being strengthened does not alter this. Rather, these changes will provide line management with greater technical assistance, more consistent policy, and the Department with more credible oversight and validated success in these areas.

PROGRAM ORGANIZATION

The new Environment, Safety and Health Program consists of six major units: Nuclear Safety, Operational Safety, Quality Assurance, Environmental Audit and Compliance, Environmental Guidance, and Environmental Analysis. Their activities include: the development of policies and standards; oversight, including the Environmental Survey, Technical Safety Appraisals and functional appraisals to monitor program and field performance in complying with DOE safety policies and standards, and in achieving effective safety and quality performance; technical assistance as needed to foster compliance; maintenance of the resources to respond to radiological emergencies; the review of NEPA documents; and the analysis of energy/environmental issues pertaining to the energy supply industry and to energy use arising from environmental legislative and regulatory activities.

FY 1986 PROGRAM PLANS

During FY 1986, we are focusing our activities on implementing the Secretary's new initiatives and upgrading our base program from within existing Departmental resources. The FY 1986 plans for the Environment, Safety and Health program include actions to:

- Implement the Environmental Survey by completing all necessary planning and preparatory activities and initiating the Environmental Survey for the first group of 5 sites.

- Begin the in-depth Technical Safety Appraisals of the safety of operations at Category A reactors (20 megawatts thermal or greater), high hazard nuclear facilities, and selected moderate hazard nuclear facilities to be completed on a three-year cycle.

- Issue revised DOE Safety and Quality Assurance Orders, and review and revise, as appropriate, DOE Environmental Orders.
- Review reactor safety analysis reports and nuclear facility safety analysis reports. These are in-depth multidisciplinary reviews to assure that an adequate degree of protection of the safety, health, and environment has been designed into reactors, high hazard nuclear facilities, and selected moderate hazard nuclear facilities.
- Implement additional modules on the Safety Performance Measurement System for environmental, safety reporting, radiation exposure data, and standards information, and a personnel and resources directory.
- Development of the Nuclear Criticality Safety Information System will continue with the system being expanded to a nuclear safety database which will include human factors and other nuclear safety data.
- Conduct technical evaluations of aviation operating procedures including eight appraisals of DOE aviation operating contractors.
- Develop guidelines on concept and content of a DOE Quality Improvement Program and Operation Readiness Reviews, and on the application and implementation of quality assurance principles and requirements to DOE computer program software and research and development programs.
- Develop environmental standards and provide environmental guidance and compliance assistance to the programs and field offices, and provide oversight of DOE programs, projects, and operations subject to environmental requirements.
- Implement DOE's regulatory review and coordination system to systematically identify, track, analyze, and prepare responses on external environmental, safety and health regulatory activities potentially affecting DOE activities and operations. Significant activities are anticipated with respect to the RCRA and CERCLA Acts.
- Continue to participate in analyses and research related to regional and global environmental issues such as acid rain, climate change, deforestation, and nuclear winter as well as analysis of regulatory and legislative

proposals affecting energy elements. Much of this work involves participation in interagency and international meetings.

FY 1987 FUNDING

The FY 1987 budget request for the Environment, Safety and Health Program, is $76.1 million, an increase of $29.2 million above the adjusted appropriation for FY 1986 as noted in the following table. The increase is principally for beginning work on the Environmental Survey. The Environmental Survey is supplementary to the base program for environment, safety and health, and to ongoing environmental projects and corrective actions. Thus, funding for the Environmental Survey will not displace these other efforts.

FUNDING SUMMARY

(Budget Authority in Millions)

Environment, Safety and Health	FY 1986 Adjusted Appropriation	FY 1987 Request	Change
Environmental Audit and Compliance	$ 7.5	$ 34.0	$ +26.5
Nuclear Safety	16.9	17.2	+ 0.3
Operational Safety, Quality Assurance, and Environmental Guidance & Analysis	11.4	11.3	- 0.1
Program Direction	9.7	11.5	+ 1.8
Capital Equipment	1.4	2.1	+ 0.7
Total ES&H	$ 46.9	$ 76.1	$+29.2
Staffing (FTE's)	125 a/	127 a/	+2

a/Excludes 3 FTE's budget under the Nuclear Waste Fund.

FY 1987 PROGRAM PLANS

Environmental Audit and Compliance. This new office has the responsibility for conducting the Environmental Survey, for coordinating the Department's environmental issues review, and for field liaison on compliance issues and agreements. The FY 1987 budget request is $34.0 million, an increase of $26.5 million. During FY 1987, we will conduct the survey of approximately 20 DOE sites, and continue to coordinate Departmental environmental activities such as compliance with RCRA and CERCLA requirements.

Nuclear Safety, $17.2 million, has been increased 2 percent over FY 1986, with significant activity occurring on the new Secretarial initiative, the Technical Safety Appraisals. During 1987, we will perform extensive safety reviews of DOE facilities, including twenty-three Technical Safety Appraisals of Category A reactors and high hazard nonreactor nuclear facilities.

Emphasis will also be placed on the review and concurrence of reactor and nonreactor nuclear facility safety analysis reports covering new facilities or modifications and upgrading of existing facilities. The program will also maintain a viable radiological emergency response capability for DOE facilities utilizing the Atmospheric Response Advisory Capability and the Aerial Measurement System. Emergency response support will be made available to the DOD, and in coordination with the Federal Emergency Management Agency, on request to other federal and state authorities.

The budget request for Operational Safety, Quality Assurance, and Environmental Guidance and Analysis is $11.3 million which is essentially the same amount in FY 1987 as appropriated in FY 1986. Emphasis will be placed on issuing revised environmental protection, safety and health protection policy guidance for Departmental projects and operations, including comprehensive direction on hazardous waste (RCRA/CERCLA) requirements. This includes an aggressive role in developing and coordinating comments on new and revised environmental statutes, rules and policies of other agencies potentially impacting DOE and assuring clear, adequate guidance to our field operations. The base activities of appraising operational safety of the DOE facilities, assisting DOE program and field organizations in their development and implementation of the Quality Improvement Program concept, independently reviewing NEPA and other supporting environmental documents to assure adequate compliance, and participating in Departmental environmental analysis and research including acid rain issues will continue.

The budget request for Program Direction, $11.5 million, represents an 18 percent increase in FY 1987 over FY 1986 to support the increased staff necessary to implement the new Secretarial initiatives of the Environmental Survey and the Technical Safety Appraisals, and associated increased travel and contractual support.

The budget request for Capital Equipment, $2.1 million, is $0.7 million greater in FY 1987 than FY 1986. The increase is principally required to establish and operate the Computer Assisted Tracking System for environmental and safety data to monitor compliance and progress in completion of corrective actions at DOE facilities, and to assist ES&H in the early identification and correction of adverse safety trends and in reducing areas of environmental and safety risk.

SUMMARY

In summary, Mr. Chairman, the Secretary's new initiatives in environment, safety and health underscore the Department's commitment to protecting the environment and giving high priority to public and worker health and safety in our operations. Our FY 1987 budget request will enable us to accomplish our environment, safety and health goals in a responsible manner.

BIOGRAPHICAL SKETCH

MARY L. WALKER

Mary L. Walker was nominated by the President for the position of Assistant Secretary for Environment, Safety and Health, U. S. Department of Energy (DOE), on September 23, 1985, and confirmed by the Senate in December 1985. In this position, she manages the Department's environmental and safety guidance, compliance and oversight functions. Her responsibilities include oversight of over 260 nuclear facilities and 160 non-nuclear facilities. She also develops the Department's environmental and safety policies and standards and assists the Department's field operations and programs in the areas of new project review, liaison with states and federal agencies, technical expertise and compliance.

From June until December, 1985, Ms. Walker was a special consultant to the Secretary of Energy. Previously, she served as the Deputy Solicitor for the Department of the Interior under William Clark. In this role, she supervised 220 attorneys including eight Regional offices, and provided legal counsel to the Secretary and program heads on the many varied legal issues involving that Department.

In 1982 she was recruited by the Reagan Administration as the chief Deputy Assistant Attorney General in the Land and Natural Resources Division, U.S. Department of Justice. She supervised a staff of 155 persons and managed the federal government's environmental litigation, involving over 2,500 cases relating to the federal government's protection and regulation of land and natural resources.

Ms. Walker was a partner with the Los Angeles law firm of Richards, Watson, Dreyfuss & Gershon, practicing in the areas of land use and environmental law and litigation from 1976-1982. In addition to representing individual and corporate clients, Ms. Walker represented various public entities, including approximately twelve Southern California cities. She handled matters involving federal and state agencies, and is experienced in both federal and state court litigation.

From 1973-1976, Ms. Walker was an attorney with Southern Pacific Transportation Company in San Francisco. She represented Southern Pacific and its diverse subsidiaries, including railroad, pipeline, trucking and land companies, in the then-emerging area of environmental law.

Ms. Walker received her B.A. in biological sciences/ecology from the University of California at Berkeley in 1970. She attended U.C.L.A. Law School and Boston University Law School, receiving her J.D. in 1973.

February 1986

PREPARED QUESTIONS FOR THE RECORD

Chairman HATFIELD. Secretary Walker, I first of all want to commend you and the Department, through you, for a new emphasis on environmental, health, and safety concerns at DOE facilities. That is an important step in the right direction, and I wholeheartedly support it.

We do have some questions that we will submit to you and the other witnesses, as well as to respond to for the record. With the pressing other schedules, I may have to refrain from engaging in a verbal presentation of them. But they will be presented to you.

I also understand that several other members have questions as well. All of these will be placed in the record at this point.

Thank you very much.

Ms. WALKER. Thank you.

Chairman HATFIELD. One slight omission, Dr. Trivelpiece, your budget—and I am sure you will work this out in an amendment, although I am sure it is a matter of oversight—was the funding of the Oregon science facility that is supposed to carry on in this year's budget.

Thank you very much. [Laughter.]

[The questions and answers follow:]

QUESTIONS SUBMITTED BY SENATOR HATFIELD

High Energy Physics

Question: For operating expenses, please provide a detailed breakdown of the funding levels in FY 85, FY 86, and FY 87 for the accelerator sequence ($60.7 million in FY 87) and the other facilities ($40.0 million in FY 87) at Fermi Lab.

Answer: I would like to insert for the record the Fermilab facility operations breakdown.

FERMILAB FACILITY OPERATIONS BUDGET BREAKDOWN
(B/A in Millions)

	Actual FY 1985	Estimated FY 1986	Request FY 1987
Personnel and Materials Required for Operation of Accelerators and Antiproton Source	$ 18.8	$ 21.7	$ 22.2
Electrical Power and Cryogenic Fluids for Operation of Accelerators	14.4	2.0	15.1
Support Groups for Development, Maintenance, Repair, Modifications and Improvements to the Accelerators and Antiproton Source	16.3	26.1	23.4
OPERATION OF ACCELERATOR FACILITIES	$ 49.5	$ 49.8	$ 60.7
Personnel and Materials Required for Operation of Fixed Target Experimental Areas, Including Electrical Power and Cryogenic Fluids	5.4	5.3	5.8
Support Groups for Development, Maintenance, Repair, Modifications and Improvements to All Experimental Areas	17.6	16.1	18.1
Personnel and Materials Required for Operation of Colliding Beam Experimental Areas	1.5	2.6	4.3
Operation of Data Acquisition, Electronics and Central Computing Facilities	9.2	10.7	11.8
OPERATION OF EXPERIMENTAL FACILITIES	$33.7	$34.7	$ 40.0
TOTAL FACILITY OPERATIONS	$83.2	$84.5	$100.7

Question: For operating expenses, provide a detailed breakdown of the funding for each facility at SLAC including levels for FY 85, 86, and 87.

Answer: I will provide a table for the record which gives a breakdown of facility operations expenses provided by SLAC. However, I would like to caution that neither the Department nor SLAC budgets on the basis of this type of breakdown, and thus, the data are "best guess estimates" which are therefore somewhat rough.

(The information follows:)

SLAC FACILITY OPERATIONS EXPENSES
(Thousands of Dollars)

	Actual FY 1985	Estimated FY 1986	Requested FY 1987
LINAC and SLC*	$18,960	$24,910	$47,700
SPEAR RING	2,710	2,400	2,500
PEP RING	14,385	9,310	6,400
END STATION A	--	150	--
GEN'L LABORATORY PROGRAM**	14,420	13,013	12,000
TOTAL SLAC	$50,835	$49,783	$68,600

* LINAC and SLC operations are so intertwined that it is not meaningful to try to separate them. Therefore, a single category is used for both.

** The General Laboratory costs are those which are necessary for an operating laboratory, but which are not identifiable with any of the particular facilities. Examples are the central computer facility and advanced accelerator R&D.

Question: Your budget justification mentions "reduced operation of other HEP accelerator capabilities." Please provide a breakdown of these reductions with FY 85, 86, and 87 levels for funding.

Answer: In FY 1987, there are major incremental costs required to initiate operation of two new world-forefront facilities; the Tevatron collider at Fermilab and the Stanford Linear Collider. At Fermilab, this includes costs for incremental power and cryogenic fluids to operate the Tevatron and incremental operating costs for the Collider Detector Fermilab (CDF), experimental hall, and antiproton source. It should be noted that the antiproton source itself includes two 8 GeV accelerators, the Accumulator and Debuncher; the antiproton target; and beam transport systems. It should also be noted that because of funding reductions and construction downtime, the Tevatron did not operate at all for research in FY 1986. At SLAC, the increased operating costs include incremental power costs due to increased megawatt load and overall usage as a result of SLC operations, increased WAPA rates, and the necessity to purchase power from Pacific Gas and Electric; klystron replacements; and transfer of needed operating manpower, 50 MY, for SLC from construction.

In order to accommodate the needs of these new facilities within the funding available in the request, it is necessary to reduce operation of the SLAC Positron-Electron Project, PEP, the Stanford Positron Electron Asymmetric Ring, SPEAR, and the BNL Alternating Gradient Synchrotron, AGS, below the pre-Gramm-Rudman-Hollings levels of FY 1986 which were the basis for the budget narrative. In addition to these reductions, it is also necessary to reduce Tevatron fixed-target operations below FY 1985. The AGS is expected to run 26 weeks in FY 1987 for high energy physics compared to 30 weeks in FY 1986 pre-Gramm-Rudman-Hollings; 24 in post-Gramm-Rudman-Hollings. SPEAR is projected to run for 13 weeks for high energy physics in FY 1987 compared to 14 in FY 1986 post-Gramm-Rudman-Hollings; 16 pre-Gramm-Rudman-Hollings. PEP is projected to run 17 weeks in FY 1987 compared to 20 in FY 1986 post-Gramm-Rudman-Hollings; 22 pre-Gramm-Rudman-Hollings. The Tevatron fixed-target program is projected to run 13 weeks in FY 1987 compared to 30 weeks in 1985. This program did not operate in FY 1986 due to construction-related shutdowns. In FY 1987, the Tevatron can operate in either the fixed target or the colliding beam mode, but not both simultaneously.

Question: For the record, provide a breakdown of all construction projects and major capital equipment items funded in FY 84, FY 85, FY 86 and proposed for FY 87 with funding levels, TEC, and remaining costs.

Answer: The breakdown of all construction projects and major capital equipment items is provided in a table I would like to insert in the record.

(The information follows:)

HIGH ENERGY PHYSICS

CONSTRUCTION AND MAJOR EQUIPMENT FUNDING

(B/A IN MILLIONS)

Construction

	FY 1984	FY 1985	FY 1986	FY 1987	Future Years	TEC
AIP	$ 9.0	$10.0	$10.1	$11.5	(Annual)	N/A
GPP	7.0	10.2	10.0	11.2	(Annual)	N/A
Tevatron II	13.0	12.0	-	-	$ -	$49.0
Tevatron I	20.0	21.3	8.2	0.4	-	84.0
SLC	32.0	60.5	21.9	1.0	-	115.4
Fermilab Computing Upgrade	-	-	3.0	14.2	6.9	24.1
AGS Accumulator Booster	-	-	1.9	3.5	21.0	26.4

Major Capital Equipment Items (DOE Cost)

	FY 1984	FY 1985	FY 1986	FY 1987	Future Years	TEC
Mark II (SLAC)	$ 4.1	$ 3.5	$ 2.6	$ -	$ -	$ 11.3
SLD (SLAC)	-	2.1	7.0	14.5	25.6	49.2
CDF (Fermilab)	9.8	11.6	9.0	-	-	40.6
D-Zero (Fermilab)	-	0.6	7.5	12.5	29.5	50.1
L3 Detector (CERN)	3.0	5.0	6.3	6.6	3.8	26.4

Question: Explain the need for your request for the central computing upgrade in FY 87.

Answer: Construction of the new computer building at Fermilab is presently under way in FY 1986. Completion of the building in FY 1987 as planned will require about $5 million of FY 1987 funding. The balance of the FY 1987 request, $9 million, is urgently needed to initiate the procurement of the key portions of the major computer hardware and allow delivery and initial utilization of this computer capability on a schedule needed for analysis of the data from the Tevatron experiments.

Question: What is the impact of holding Physics research - operating at the FY 86 level in FY 87?

Answer: The FY 1987 budget request would maintain the FY 1985 level of effort. In FY 1987, many new experiments are coming into operation with first operation of the Tevatron and SLC colliders and completion of the final elements of the fixed-target upgrade at Fermilab. The research groups need to be maintained at a level sufficient to effectively carry out these experiments. The impact of holding funding in FY 1987 at the FY 1986 level after Gramm-Rudman-Hollings reductions would be severe. This would be a reduction of almost 10 percent below the FY 1985 level. There would be manpower reductions of at least 100 physicists and 100 other staff in the program, largely at universities. There would be a stretch out and delay of many experiments.

Superconducting Super Collider

Question: How much is requested in FY 87 for continued R&D on the SSC (Superconducting Super Collider)?

Answer: The direction and emphasis of the FY 1987 accelerator R&D program, particularly in the area of superconducting accelerator magnets and associated systems, will depend on the results of the Department's review of the SSC this summer. We felt it premature to identify specific funding for the project prior to completion of our review. The FY 1987 request of $95.5 million for the subprogram which funds accelerator R&D will maintain an approximately constant level of effort with FY 1985 and FY 1986 pre-Gramm-Rudman-Hollings. R&D on the magnets and other systems specific to SSC will be needed in FY 1987. This would include important participation by industry to incorporate further cost-saving ideas and manufacturing techniques, operation of a string of full-length magnet prototypes to test systems designs, and further improvements to the superconducting wire.

Questions: What is the status of the SSC? Your budget justification indicates that you plan "an in-depth Departmental review of plans and designs this summer." What will be the next step?

Answer: R&D on the SSC is progressing well and has had significant successes. The SSC Central Design Group, with participation from the laboratories, universities, and industry, is in the final stages of preparing a detailed Conceptual Design Report. This report will contain a detailed design, with costs and schedule, based on the results of the R&D program. The Department, using this input, will conduct a very thorough review this spring of the entire scientific, technical, and cost aspects of the SSC. This review will serve as important input to the next step, which will be the Department's decision this summer on whether to seek authorization to initiate construction of the project in FY 1988. The direction and emphasis of the FY 1987 accelerator R&D program for the SSC will depend on the results of this review and decision. FY 1988 would be the earliest year that construction authorization would be requested.

Question: When will the Administration make a decision on construction?

Answer: The Department is planning to make a decision this summer on whether to seek authorization for construction to begin in FY 1988. It is planned that the timing for this decision be such that the project could be considered for construction during the normal FY 1988 budget process.

Question: When will a recommendation or proposal be available on site selection?

Answer: In December 1984, the Department announced a plan for site selection to be used at an appropriate time. This includes the use of an evaluation committee which the National Academies of Science and Engineering have agreed to establish to select a small number of the very best sites. At the request of the Department, the SSC Central Design Group prepared a site parameters document listing essential and desirable features of the site. This was made available on request in June 1985. No request for SSC site proposals is planned until after the Department has committed to proceed with the project.

Question: Please provide a breakdown of funding for SSC at the labs and other laboratories for FY 85, 86 and 87.

Answer: I would like to provide the breakdown of SSC R&D at the laboratories for FY 1985 and FY 1986 as an insert for the record.

(The information follows:)

SSC R&D FUNDING BY LABORATORY
(B/A IN MILLIONS)

	Actual FY 1985	Projected FY 1986
Brookhaven National Laboratory	$ 5.1	$ 3.3
Fermi National Accelerator Laboratory	4.0	3.3
Lawrence Berkeley Laboratory	0.8	1.4
Texas Accelerator Center	5.0	2.6
Architect Engineering Services	0.8	1.5
Central Design Group and others	4.3	7.9
	$20.0	$20.0

As discussed earlier, specific SSC R&D funding and direction for FY 1987 have not yet been identified, pending the results of the Departmental review this summer. The Central Design Group has indicated a need for $30 to $40 million for R&D in FY 1987 if construction is to proceed in FY 1988. Although the full amount cannot be accommodated within the FY 1987 request for high energy technology, we believe that by focusing on the most critical SSC requirements, the highest priority FY 1987 needs for SSC R&D could be accommodated within the overall FY 1987 request.

Question: Provide a breakdown of funding for each activity of the SSC in FY 85, 86 and 87.

Answer: I would like to provide an insert showing the breakdown of SSC R&D by activity.

(The information follows:)

SSC R&D FUNDING BY ACTIVITY
(B/A IN MILLIONS)

	Actual FY 1985	Projected FY 1986
Administrative Support	$ 2.1	$ 2.6
Accelerator Physics	1.0	1.4
Conventional Systems	1.1	2.5
Magnet Program	14.5	10.1
Other Accelerator Systems	1.3	3.4
	$20.0	$20.0

As discussed above, no specific SSC funding for 1987 has been identified pending the results of the Departmental review this summer. The FY 1986 distribution reflects the redirection of activities following the magnet selection decision to emphasize R&D on the single selected magnet design and on development of the Conceptual Design Report and cost estimate. FY 1987 R&D needs include important participation by industry to incorporate further cost-saving ideas and manufacturing techniques, continued magnet R&D, R&D on other accelerator subsystems, operation of a string of full-length magnet prototypes to test systems designs, and further improvement to the superconducting wire.

Nuclear Physics

Question: What is the operating budget including direct costs and other research activities funded in nuclear physics for the seven existing national accelerator facilities in FY 83, FY 84, FY 85, FY 86 and FY 87? For the on campus accelerators?

Answer: The information is shown in a table I would like to insert in the record.

(The information follows:)

Budget Profiles (Thousands of Dollars)*

	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987
Argonne National Laboratory - ATLAS					
Facility Operations	$1,609	$2,050	$2,795	$2,619	$2,970
Research Activities**	3,596	4,130	4,695	4,435	4,950
Brookhaven National Laboratory - Tandem/AGS					
Facility Operations	$1,251	$1,520	$1,500	$3,193	$8,670
Research Activities**	2,250	2,400	2,630	2,765	3,310
Lawrence Berkeley Laboratory - Bevalac/SuperHILAC					
Facility Operations	$14,474	$16,145	$17,426	$16,649	$19,690
Research Activities**	4,455	6,014	6,056	5,609	6,315
Lawrence Berkeley Laboratory - 88 Inch Cyclotron					
Facility Operations	$1,788	$2,002	$2,044	$1,956	$2,185
Research Activities**	2,150	2,349	2,729	2,600	2,850

	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987
Los Alamos National Laboratory - LAMPF					
Facility Operations					
Nuclear Physics	$29,334	$32,050	$36,145	$37,385	$42,920
Defense Programs	3,000	3,000	3,100	0	0
Research Activities**					
Nuclear Physics	5,856	6,202	7,339	6,681	7,400
Health & Environmental Research	-	373	378	348	280
Basic Energy Sciences	-	24	49	888	811
High Energy Physics	-	22	46	60	60
Massachusetts Institute of Technology - Bates Linear Accelerator					
Facility Operations	$4,738	$5,645	$5,675	$5,332	$6,440
Research Activities**	1,762	2,295	2,500	2,349	2,600
Oak Ridge National Laboratory - Holifield Heavy Ion Research Facility					
Facility Operations	$4,457	$4,715	$4,955	$4,682	$5,185
Research Activities**	3,535	4,040	4,150	3,916	4,455
Duke University - Triangle Universities Nuclear Laboratory					
Facility Operations	$ 510	$ 655	$ 685	$ 610	$ 715
Research Activities	1,040	1,090	1,140	1,083	1,200

	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987
University of Washington - Tandem/Superconducting Booster Accelerator					
Facility Operations	$ 610	$ 730	$ 720	$ 680	$ 805
In-House Research	908	1,135	1,085	1,057	1,170
Yale University - Tandem Van de Graaff					
Facility Operations	$ 960	$1,040	$1,085	$1,029	$1,270
Research Activities	940	1,045	1,090	1,029	1,140

* Nuclear Physics funds except as noted
** Does not include direct support of outside users

Question: What is the utilization level overall for each facility in FY 85, FY 86, FY 87?

Answer: The facility utilization level is shown in a table I would like to insert in the record.

(The information follows:)

BEAM HOURS

	Beam Hours For Research		
	FY 1985	FY 1986	FY 1987
ANL - ATLAS	1651	4000	4300
BNL - MP Tandem	2300	2000	1700
BNL - Tandem/AGS	0	0	1000
LBL - Bevalac/SuperHILAC	3353	2700	3400
LBL - 88-Inch Cyclotron	4017	2900	3300
LANL - LAMPF	3325	2100	2800
MIT - Bates Linear Accelerator	2515	1700	2400
ORNL - Holifield Heavy Ion Research Facility	3900	4000	4000
Triangle Universities Nuclear Laboratory	6365	6498	6500
University of Washington - Tandem/Booster	4340	3596	3720
Yale University - Tandem Van de Graaff	4231	1580	4600

Question: What capital equipment items would be deferred in FY 87 if $14 million was provided?

Answer: The Nuclear Physics program emphasis is changing to increased research on higher energy facilities, such as the Brookhaven National Laboratory Tandem/AGS program. It also requires more sophisticated detectors for more difficult experiments, such as neutrino scattering and muon decay searches at LAMPF. These new directions are much more capital equipment intensive than the traditional program. Therefore, reductions in the capital equipment area will most severely impact our ability to utilize most effectively our new accelerator capabilities. Upon review and in coordination with programmatic activities, capital equipment reductions from the planned level would be in some of the following areas.

1) Delay of completion of the Duke University polarized ion source
2) Delay of completion of a gamma-ray detector array at ANL
3) Postponement of a large solid-angle detector at LBL
4) Reduced general expenditures at ORNL
5) Delay in completion of the neutron time-of-flight facility and magnetic spectrometer at LANL
6) Provide for a slower start-up of experiments at the BNL Tandem/AGS facility.

Continuous Electron Beam Accelerator Facility

Question: Please provide a breakdown and explanation of the total operating expenses request for FY 87.

Answer: The following table is a breakdown of the FY 87 operating expenses request I would like to insert in the record. These funds would be used entirely for R&D activities in support of the CEBAF construction effort.

(The information follows:)

CEBAF OPERATING EXPENSES

	Budget ($M)
Manpower Support	4.32
-- Advanced accelerator design and optimization	
-- Instrumentation and controls prototyping	
-- RF system prototyping	
-- Beam transport magnet prototyping	
-- Cryogenic system R&D	
-- Experimental equipment design	
-- Test cryomodules and replacement units	
Procurement supporting in-house R&D	0.57
-- Laboratory test equipment	
-- Safety related equipment	
R&D Contracts for prototype units	1.36
-- Cryostats	
-- Superconducting accelerating cavities	
-- Beam transport magnets	
Total	6.25

Question: What is the total estimated cost of the project? What is the basis for this estimate?

Answer: The total estimated cost (TEC) for the CEBAF project is $236 million. The estimates for conventional construction are based on a conceptual design study by the A/E firm of Daniel, Mann, Johnston, and Mendenhall. The cost estimates for technical components were based on vendor quotes, current catalogue prices, and estimates by the CEBAF engineering staff. The TEC includes allowances for engineering, design, inspection, administration, and installation. It is based on a construction schedule beginning in the second quarter of FY 1987 and ending the second quarter of FY 1992. The costs have been reviewed by the Office of Energy Research Division of Nuclear Physics Staff, by the Office of Energy Research Division of Construction, Environment and Safety Staff, by the Management and Administration Division of Independent Cost Estimating. Independent Non-DOE experts were also utilized to review specific critical parts of the cost estimates.

Question: What is your estimate of the annual operating expenses for the project? What is its estimated useful life?

Answer: The estimated annual facility operating costs including in-house research, but not including plant and capital equipment costs are $27 million per year. This reflects an annual savings of $3 million due to reduced power requirements resulting from the improved design. The estimated useful lifetime for a research facility of this type is about 20 years. This useful lifetime can be significantly increased by occasional judicious upgrading in response to technological advances and research requirements.

Question: Describe any other sources of funding for the project.

Answer: CEBAF has received funding from three sources other than the Federal government. The breakdown of this funding is shown in a table I would like to insert in the record.

(The information follows:)

Commonwealth of Virginia	Funding Provided
FY 1984	$ 160,000
FY 1985	1,000,000
FY 1986	1,000,000
FY 1987	1,000,000
FY 1988	1,000,000
Total Commonwealth of Virginia	$ 4,160,000

SURA Member Universities

Contributions from Southeastern Universities Research Association, SURA, member universities are from yearly membership fees of $5,000/university and from special assessments of member universities. The cumulative income from this source as of March 13, 1986, was $394,500.

City of Newport News

The city of Newport News is donating to DOE, through SURA, a total of 250 acres of land as a site for CEBAF, and is donating to SURA an additional 50 acres to be held for possible future use by the project.

Basic Energy Sciences

Question: For the record, provide a breakdown of the BES budgets in operating, construction, and capital equipment for FY 80 through FY 87.

Answer: The breakdown for the Basic Energy Sciences budget, in millions of dollars, is shown in the a table that I would like to insert for the record.

(The information follows:)

	B/A							
	FY 80	FY 81	FY 82	FY 83	FY 84	FY 85	FY 86	FY 87
Operating..	202.5	215.2	236.4	261.8	295.8	337.3	340.1	380.1
Capital Equipment.	17.4	14.5	16.4	18.2	24.3	31.1	26.2	31.8
Construction......	15.9	3.9	.7	3.4	17.2	42.4	67.5	29.5
Total.....	235.8	233.6	253.5	283.4	337.3	410.8	433.8	441.4

Question: Your justification material last year indicated that the principal focus of BES is energy, but a number of other national goals including national security also are supported. Please provide an explanation of national security research and the beam time used by DOD and DOE defense programs at each BES facility for FY 85, 86, and 87.

Answer: National security research at each of the BES facilities takes a variety of forms. In some cases beam time is not an appropriate measure of activity, for example the production of certain isotopes for defense applications at High Flux Isotope Reactor/Transuranium Processing Plant (HFIR/TRU) at ORNL. It is useful to separate the answer into the categories of synchrotron radiation facilities (Stanford Synchrotron Radiation Laboratory (SSRL) and National Synchrotron Light Source (NSLS)), neutron facilities (Intense Pulsed Neutron Source (IPNS), Los Alamos Neutron Scattering Center (LANSCE), High Flux Isotope Reactor (HFIR), and High Flux Beam Reactor (HFBR)) and other (primarily the Combustion Research Facility, Electron Microscope Facilities and HFIR/TRU).

Use of synchrotron radiation for DOD and DOE defense programs is valuable for calibration of instruments for radiation detection and for research on the properties of materials and interaction of radiation with matter. At SSRL and NSLS this activity has averaged about 10 percent of the available beam time in FY 85 and FY 86 and is expected to remain at that level for FY 87. Several defense laboratories have built beam lines or are in the process of building beam lines at both SSRL and NSLS to conduct their experiments.

With the neutron facilities, the situation varies from facility to facility. At the Los Alamos Neutron Scattering Center, defense related activities will be a minimum of 20 percent of available beam time in FY 87. At HFBR and HFIR, users from defense laboratories average about 10 percent of the total number of users, but vary from year to year. At IPNS, a relatively small amount of neutron beam time was used by defense related laboratories. However, the injection system for IPNS has been scheduled for neutral particle beam experiments, important for defense purposes, for 10 weeks in FY 86 and a similar level is expected for FY 87.

At the remaining facilities, the Combustion Research Facility conducts 20 percent of their research for defense related activities on a continuing basis, the electron microscope facilities at Argonne National Laboratory are utilized between 1 and 5 percent of the time by defense laboratories; and HFIR produced isotopes are used to a relatively large extent by defense laboratories. For example 30 grams of curium-244 have been shipped so far in FY 86 to DOE defense program laboratories at LLNL and LANL.

Although a fraction of the effort around these facilities has been specifically identified as being conducted by defense laboratories, it is clear from our discussions with managers of these facilities that all of the output from the facilities is carefully monitored and useful in a more generic sense.

Question: What is the level of operating for materials sciences at the various facilities from FY 81 through FY 87?

Answer: The level of operating for the major user facilities for Materials Sciences, in thousands of dollars, is shown in a table I would like to insert in the record.

(The information follows:)

Materials Sciences
Facility Funding
(Dollars in thousands)

	FY 81	FY 82	FY 83	FY 84	FY 85	FY 86	FY 87
High Flux Beam Reactor (HFBR)	$4,067	$4,700	$6,057	$7,032	$8,643	$ 8,425	$ 9,100
National Synchrotron Light Source (NSLS)	2,599	3,098	5,922	7,962	9,750	11,100	13,300
Intense Pulsed Neutron Source (IPNS)	4,929	3,685	3,895	4,712	4,830	4,800	5,000
High Voltage Electron Microscope Tandem Facility (HVEM)	560	550	615	685	750	780	1,000
National Center for Electron Microscopy (NCEM)	505	767	880	1,090	1,400	1,280	1,400
Stanford Synchrotron Radiation Laboratory (SSRL)	0	0	0	700	1,140	1,107	1,800
Los Alamos Neutron Scattering Center (LANSCE)	0	0	0	0	0	0	1,300
Center for Advanced Materials (CAM)	0	0	0	2,200	2,800	3,100	3,400
ORNL/Low Temperature Neutron Irradiation Facility	0	0	0	400	705	1,000	1,200
ORNL/Surface Modification and Characterization Laboratory	0	0	460	500	959	920	1,100
Other	1,100	1,300	1,452	1,500	1,620	1,500	2,000

Question: Explain the need for a $9 million increase in FY 87.

Answer: The $8.6 million increase over FY 86 is needed primarily to continue the same level of operations in FY 87 as in FY 86, which is not optimal. The major components of the increase are: increased safeguards and security costs at HFBR, the first installment of operations funding at the Los Alamos Neutron Scattering Center, the increased operation of the NSLS now that the X-ray ring is beginning full operation, and increased support at SSRL to permit better utilization of that frontier facility including the PEP beamlines.

Question: What is the status of the Center for Advanced Materials (CAM) project?

Answer: The status of the Center for Advanced Materials (CAM) project is that the construction is on schedule and within the budget projections. The CAM project consists of two buildings, the Surface Science and Catalysis Laboratory (SSCL) and the Advanced Materials Laboratory (AML). The SSCL is in the construction phase, concrete foundations have been poured and steel-work is being erected. An occupancy date of May 1987 is expected. The AML is fully designed and construction will begin in a few months. An occupancy date of September 1988 is expected. Until the buildings are ready for CAM personnel, research is being conducted at available space throughout LBL. Research at a level of about $3 million total is underway in the areas of catalysis, ceramic/metal interfaces, instruments and sensors, electronic materials, light alloys and polymers and composites.

Question: How much is requested for operating and construction in FY 84, 85, 86, and 87?

Answer: For the Center for Advanced Materials, the construction appropriations request is $10,560,000 for FY 1987. The corresponding levels in previous years are $1,760,000 in FY 1984, $9,290,000 in FY 1985 and $11,008,000 in FY 1986. The CAM research funding which is being requested in FY 1987, the only operating funds requested, for this project, are $3,400,000. The corresponding research levels in previous years are $2,200,000 in FY 1984, $2,800,000 in FY 1985, and $3,100,000 in FY 1986.

Question: Describe the extent of industrial and university participation in the project.

Answer: Industrial and university participation in research at the Center for Advanced Materials has been quite substantial considering the early stage of the CAM program. At the moment, the research operation program level is about $3 million and researchers are occupying available space at LBL until the CAM project buildings are complete. CAM has attracted about 60 students. The research programs are run by faculty members at the University of California or personnel connected with LBL and the University. There are about 20 faculty members involved with CAM.

Each of the research projects has been designed with participation from industry and other university researchers. In addition, there have also been 67 visitors from industry and 6 gifts/contracts from industry to date. It should be noted that all this outside participation has taken place even at this early stage of the program.

Question: Provide a table showing the breakdown of chemical science operating expense at the various facilities in FY 84, FY 85, FY 86 and FY 87.

Answer: The breakdown is shown in a table I would like to insert in the record.

(The information follows:)

CHEMICAL SCIENCES

	Operating Expenses Dollars in Thousands			
	FY 1984	FY 1985	FY 1986	FY 1987
Combustion Research Facility (CRF)	$ 5,489	$ 5,715	$ 5,400	$ 5,930
Facility Operation	3,220	3,375	3,250	3,660
Facility Research	2,269	2,340	2,150	2,270
National Synchrotron Light Source (NSLS)	$ 6,370	$ 7,265	$ 6,940	$ 7,750
Facility Operation	4,470	5,350	5,150	5,800
Facility Research	1,900	1,915	1,790	1,950
Kansas State University (KSU)	$ 0	$ 0	$ 240	$ 350
Facility Operation	0	0	240	350
Total Chemical Sciences	$11,859	$12,980	$12,580	$14,030

Question: Please provide the Committee with a table showing the breakdown of funding for nuclear science within the five principle activities in FY 84, FY 85, FY 86, and FY 87.

Answer: The breakdown of Nuclear Sciences (in thousands of dollars) is shown in a table I would like insert in the record.

(The information follows:)

NUCLEAR SCIENCES

	FY 1984	FY 1985	FY 1986	FY 1987
		Operating Expenses Dollars in Thousands		
Operating Expenses				
Nuclear Data	$ 9,430	$ 9,497	$ 9,282	$10,442
Isotope Preparation	12,215	14,337	16,171	18,077
Heavy Element Chemistry	4,715	4,119	4,522	5,066
Stanford Synchrotron Radiation Laboratory	6,790	6,900	6,796	8,068
Heavy Ion Fusion	4,750	4,788	4,674	5,260
Total Nuclear Sciences	$37,900	$39,641	$41,445	$46,913

Question: Explain the need for the $5.4 million increase in FY 87 for nuclear science operating expenses.

Answer: Approximately $4.0 million is required to attain a viable level of operations for six major facilities. Important driving factors are restoring lost operating staff; increased requirements for maintenance, safety modifications, and radwaste handling; increased production of enriched isotopes to replenish depleted inventories; and, increased user demand. The list of facilities includes: the Calutrons for the production of stable isotopes needed in medicine, research, and industry; the High Flux Isotope Reactor that provides neutron irradiation services for the production of isotopes and neutrons for a variety of materials studies; the Transuranium Processing Plant for the processing and purification of actinide materials including californium-252; the Stanford Synchrotron Radiation Laboratory for user studies in materials, chemical and biological sciences; and two accelerator based neutron generators needed for the measurement of data required for fission and fusion energy technology development. Approximately $1.4 million is required to maintain a viable level of research in Heavy Element Chemistry, Nuclear Data Compilation and Evaluation, and Heavy Ion Fusion Accelerator Research.

Question: Provide a detailed breakdown for applied mathematical sciences by activities with funding levels in FY 85, 86, and 87.

Answer: The breakdown for Applied Mathematical Sciences, in millions of dollars, is shown in a table I would like to insert in the record.

(The information follows:)

APPLIED MATHEMATICAL SCIENCES

	FY 1985	FY 1986	FY 1987
Analytical and Numerical Methods	$ 7.7	$ 7.6	$ 8.2
Information Analysis Techniques	2.4	2.2	2.3
Advanced Computer Systems Concepts	10.6	13.1	12.2
Energy Science Advanced Computation	13.8	15.0	10.1
Total, Applied Mathematical Sciences	$ 34.5	$ 37.9	$ 32.8

Question: With the major achievements in biological energy research, why are you proposing a $3 million reduction in FY 87 from your FY 86 levels.

Answer: The appropriated budget for the Biological Energy Research (BER) program in FY 1986, less the Gramm-Rudman reduction, was $18,248,000. The request for the program in Fiscal Year 1987 is $15,148,000, a reduction of $3,100,000 in the overall request. This reduction comes principally from the inclusion of a one-time construction item of $5,773,000 in FY 1986 for partial support of a building for a Center for Energy and Biotechnology at Tulane University. There is no additional funding for this project or other construction in FY 1987.

Question: Explain the results of your recent workshop on future research directions in biological energy and list some of the funded activities as well as the unfunded higher priority areas of research.

Answer: The participants in the recent workshop on future research direction for the Biological Energy Research program made suggestions of future needs and opportunities for research for the program. The strongest point made at the workshop was that the program should increase support of areas that it currently funds such as those listed below.

research on the genetics, biochemistry, and physiology of organisms that might be employed in fermentations of renewable biomass to fuels and chemical feedstocks using "orphan" microorganisms;

studies on complex carbohydrates with emphasis on determining chemical structure and function of this class of compounds in plants and microorganisms;

increased attention to the merging of some of the newer, powerful, sophisticated analytical procedures of physics and chemistry with difficult and complex problems of biology about which the program is concerned;

and additional emphasis on the mechanism of breakdown of lignin, cellulose and hemicelluloses, the mainstay abundant renewable resources.

Magnetic Fusion

Question: When will we be able to make an assessment of the economic feasibility of fusion power?

Answer: It is the Department's goal to have an adequate data base to make an economic assessment of fusion energy by around the turn of the century.

Question: What additional research and capital investment would be required before we could decide on the feasibility of commercial application of fusion power?

Answer: In order to develop the necessary science and technology base for an assessment of fusion's commercial application, we expect several new facilities will need to be constructed and operated to address the four remaining key issues. These facilities include an ignition/burn experiment, a materials test facility, engineering test facilities and confinement concept development experiments. It is important to note, however, that DOE does not plan to deploy all of these facilities on its own. We have been engaged in discussions with our allies under the auspices of the Economic Summit on ways to share the work.

Question: What is the total amount spent by the Federal government on magnetic fusion research?

Answer: A total of about $4.5 billion has been spent on Magnetic Fusion Energy over a thirty year period.

Question: What is the projected level of funding for the next five years?

Answer: We currently are planning on maintaining an essentially flat funding profile at the FY 1987 requested level for fusion research over the next five years.

Question: Please explain the refocusing of the fusion effort over the last three years?

Answer: As the nation's energy crisis has relaxed, we recognized that the urgency to develop fusion has also lessened. This fact together with increased budget pressures forced us to review the program strategy. Starting in FY 1985, we began modifying the program pace and priorities accordingly. A new program plan was developed to focus on the four remaining key technical issues including the development of magnetic confinement systems, exploration of scientific principles governing the behavior of a burning plasma, the development of materials for fusion applications, and the development of fusion nuclear technology. The balance of the program was modified to emphasize the development of the scientific and technological elements of the program while postponing reactor-specific work.

Tritium work on TFTR has been delayed, efforts on technology development have been focused on near term issues, and work on the tandem mirror concept will be terminated. International participation has also been used increasingly to help offset the reductions in some areas.

Question: Please provide the Committee with a facility distribution of the FY 85, 86, and 87 budgets with funding levels for each activity.

Answer: I would like to provide an insert for the record for this information.

(The information follows:)

OFFICE OF FUSION ENERGY

(DOLLARS IN THOUSANDS)

SUMMARY

	FY 1985 ACTUAL	FY 1986 ESTIMATE	FY 1987 ESTIMATE
	B/A	B/A	B/A
ARGONNE NATIONAL LAB			
APPLIED PLASMA PHYSICS	110	105	0
CONFINEMENT SYSTEMS	316	670	0
DEVELOPMENT & TECHNOLOGY	4,740	3,674	3,705
	5,166	4,449	3,705
BROOKHAVEN NATIONAL LAB			
DEVELOPMENT & TECHNOLOGY	270	250	210
	270	250	210
GA TECHNOLOGIES, INC.			
APPLIED PLASMA PHYSICS	3,006	2,384	2,560
CONFINEMENT SYSTEMS	34,565	32,077	25,600
DEVELOPMENT & TECHNOLOGY	1,148	910	995
	38,719	35,371	29,155
HANFORD ENG DEVLPMT LAB			
DEVELOPMENT & TECHNOLOGY	2,285	2,112	1,990
PLANNING AND PROJECTS	3,000	0	0
	5,285	2,112	1,990
IDAHO NTL ENGNG LAB			
DEVELOPMENT & TECHNOLOGY	2,013	1,467	1,450
	2,013	1,467	1,450
LAWRENCE BERKELEY LAB			
APPLIED PLASMA PHYSICS	532	256	305
CONFINEMENT SYSTEMS	805	1,120	0
DEVELOPMENT & TECHNOLOGY	5,985	1,910	1,545
PLANNING AND PROJECTS	200	0	0
	7,522	3,286	1,850
LAWRENCE LIVERMORE NAT LAB			
APPLIED PLASMA PHYSICS	19,584	17,992	18,565
CONFINEMENT SYSTEMS	46,575	43,195	31,800
DEVELOPMENT & TECHNOLOGY	6,635	5,907	4,840
PLANNING AND PROJECTS	21,100	4,178	200
	93,894	71,272	55,405
LOS ALAMOS NAT LAB			
APPLIED PLASMA PHYSICS	16,375	14,373	16,500
CONFINEMENT SYSTEMS	0	140	0
DEVELOPMENT & TECHNOLOGY	3,549	2,883	2,720
PLANNING AND PROJECTS	300	385	300
	20,224	17,781	19,520
MASSACHUSETTS INST TECH			
APPLIED PLASMA PHYSICS	3,255	2,758	1,855
CONFINEMENT SYSTEMS	19,144	17,393	13,000
DEVELOPMENT & TECHNOLOGY	3,297	3,150	2,950
	25,696	23,301	17,805
OAK RIDGE ASSOC UNIV			
APPLIED PLASMA PHYSICS	35	500	0
CONFINEMENT SYSTEMS	43	0	0
DEVELOPMENT & TECHNOLOGY	635	673	0
	713	1,173	0

OFFICE OF FUSION ENERGY

(DOLLARS IN THOUSANDS)

SUMMARY

	FY 1985 ACTUAL B/A	FY 1986 ESTIMATE B/A	FY 1987 ESTIMATE B/A
OAK RIDGE NATIONAL LAB			
APPLIED PLASMA PHYSICS	5.330	3.965	4.145
CONFINEMENT SYSTEMS	21.176	18.539	20.000
DEVELOPMENT & TECHNOLOGY	30.583	26.310	22.620
PLANNING AND PROJECTS	10.800	11.690	12.024
	67.889	60.504	58.789
PACIFIC NORTHWEST LABS			
APPLIED PLASMA PHYSICS	55	0	0
DEVELOPMENT & TECHNOLOGY	120	110	90
	175	110	90
PRINCETON PLASMA PHYS LB			
APPLIED PLASMA PHYSICS	7.695	6.245	6.560
CONFINEMENT SYSTEMS	92.930	81.050	85.300
DEVELOPMENT & TECHNOLOGY	1.650	1.920	500
PLANNING AND PROJECTS	13.100	1.740	500
	115.375	90.955	92.860
SANDIA NATIONAL LABS			
CONFINEMENT SYSTEMS	790	1.450	1.200
DEVELOPMENT & TECHNOLOGY	4.165	3.258	3.850
	4.955	4.708	5.050
TEXAS UNIV OF			
APPLIED PLASMA PHYSICS	4.520	3.882	3.900
	4.520	3.882	3.900

Question: What is the status of the FMIT project?

Answer: All work has been stopped on the FMIT project. Funding in FY 86 has been reduced to zero, and future funding requests are not anticipated. The design has been documented, critical research and development has been completed, and radio frequency power supplies, which were procured as part of the project, are in storage. The power supplies will be transferred to existing fusion facilities where they will be used in a cost effective way in the conduct of plasma physics research.

Question: Please give us a status report on our proposal or accord with the Soviet Union and other progress in international cooperation in magnetic fusion.

Answer: The Department's Magnetic Fusion Program Plan states that international collaboration is a key resource in the conduct of the fusion energy program. Formal agreements in place cover substantive collaboration on major technical programs and the use of existing facilities in the U.S., Japan and the European Community (EC).

The Department of Energy is co-leader of the Economic Summit's Controlled Thermonuclear Fusion Working Group formed to enhance fusion collaboration. The Fusion Working Group, composed of fusion policy officials from the Summit countries, is actively pursuing joint planning for major new facilities. The Fusion Working Group has recently developed a consensus on a common, mid-term objective, namely, an Engineering Test Reactor to address fusion nuclear technology issues.

The Geneva Summit statement by President Reagan and General Secretary Gorbachev was: "The two leaders emphasized the potential importance of the work aimed at utilizing controlled thermonuclear fusion for peaceful purposes, and in this connection, advocated the widest practicable development of international cooperation in obtaining this source of energy, which is essentially inexhaustible, for the benefit of all mankind." Discussions are proceeding among several executive departments and among the U.S., Japan, the EC, and its member states on the appropriate detailed approach for implementation of the Geneva statement. Exploratory discussions with the Soviets will be undertaken to develop mutual understanding of the possible next steps.

Question: As a result of these international negotiations with Japan, Europe, and the Soviets, there is now more talk about constructing a multi-hundred million dollar ignition device, followed by a jointly funded international fusion test reactor probably in Europe. What is your view on these developments and how much would these machines cost?

Answer: A compact ignition experiment followed by a test reactor to provide fusion nuclear technology data is a logical and natural sequence for the development of fusion energy. The ignition experiment will provide necessary scientific information and discharge control experience in the presence of a self-sustained burning plasma. The ignition experiment data will greatly facilitate the operation and optimization of the subsequent test reactor. The test reactor will provide a test bed and focus for the development of fusion technology needed for any future application of fusion.

The ignition experiment is a relatively quick and low-cost experiment compared with the test reactor. Some initial estimates place the cost of the ignition experiment at $300 million at an established site. The test reactor will probably cost about $3 billion depending on the design approach taken. International support is expected to be necessary for these facilities especially the Engineering Test Reactor.

University Research Support

Question: What is the status of the program to convert university nuclear reactors to low enriched uranium?

Answer: We are developing a long range plan and schedule to convert those university nuclear research and training reactors covered by the recent regulation issued by the Nuclear Regulatory Commission. Twenty university reactors are affected by this regulation. Of this number, two reactors are already in the process of converting to LEU fuel (Ohio State University and the Rensselaer Polytechnic Institute). Two reactors (the Massachusetts Institute of Technology and University of Missouri at Columbia) will request an exemption from the NRC regulation. A meeting was held on March 12-14, 1986, at the Argonne National Laboratory involving the operators of all the affected university reactors, the fuel fabrication contractor (Babcock and Wilcox) and DOE and NRC staff. The purpose of the meeting was to select a standard fuel plate that can meet the needs of most of the reactor facilities and to discuss the process and develop a schedule for the conversion. Funding options and schedules will be developed following this meeting.

Question: How are you utilizing the $2.0 million provided by Congress in FY 86 for LEU fuel assistance?

Answer: We are now in the process of developing a program and funding schedule for the LEU conversion. The current status of the $2.0 million appropriated in FY 1986 is shown in a table I would like to insert in the record.

(The information follows:)

Gramm-Rudman-Hollings reduction	$ 76,000
LEU fuel fabrication for FY 1986	350,000
HEU fuel shipping and storage in response to NRC order	80,000
Technical support for Universities through Argonne National Laboratory Reduced Enrichment Program for Research and Training Reactors (RERTR)	125,000
Support for a National Academy of Sciences study on the role and future of university nuclear research reactors (including the impacts of LEU conversion)	186,000
Safety analysis studies for five universities	555,000
Shipping cask certification studies for moving HEU spent fuel	100,000
Total	$1,472,000

We are currently looking at the use of the remaining funds to support safety and technical analysis studies at three to five of the plate-type university reactors. This analysis includes examining the option of carrying over the remaining funds to FY 1987 to allow for a more logical and orderly fuel conversion process.

Question: What is the status of the NRC regulation on "limiting the use of highly enriched uranium in domestic research and test reactors"? (Regulation proposed in July 1984)

Answer: The NRC approved this regulation on February 6, 1986, and the regulation was published in the Federal Register on February 25, 1986.

Question: Explain the new NRC requirements for handling this fuel.

Answer: The NRC regulation states that all domestically licensed research and training reactors must convert to LEU fuel. This regulation affects 20 university reactors and four industrial research reactors. The main features of the regulation are that conversion of each affected reactor is contingent upon Federal support of the associated conversion costs and submission of a plan for conversion by the reactor operator and subsequent approval by NRC of this plan. Following approval, NRC would issue an order directing the reactor operator to proceed with the conversion process.

We anticipate that this process will be carried out in three phases: (1) the university reactor operators will submit a proposal to DOE to conduct a safety analysis study on the use of LEU fuel in their reactors. DOE would fund the costs of these studies through the University Reactor Fuel Assistance Program;
(2) the completed safety analysis study would be submitted by the university directly to the NRC for review and approval. At the same time, DOE would place an order for the required fuel with the fuel fabrication contractor (currently Babcock and Wilcox, Lynchburg, Virginia); and (3) when the NRC issues the final conversion order for each reactor, the new LEU fuel would be shipped by DOE to the university and the existing HEU fuel returned to DOE for disposal. In accordance with a previous NRC regulation, all excess HEU fuel

has already been removed from university reactors and stored at DOE laboratory or contractor sites leaving only operating fuel in the reactors.

Question: Are there any insurmountable technical reasons for not converting these reactors to low-enriched uranium?

Answer: As far as we can tell at present, there are no technical barriers to the conversion of the plate-type and TRIGA reactors to LEU fuel. The safety and technical analysis studies to be carried out at each reactor will, of course, provide us with additional information on the use of LEU in each specific reactor. It should be noted that the two highest powered plate-type reactors, the 10 MW reactor at the University of Missouri, Columbia, and the 5 MW reactor at the Massachusetts Institute of Technology, will apply for an exemption from the NRC regulation in that a satisfactory LEU fuel does not currently exist for these two reactors.

Question: In your view, why are the universities reluctant to convert their reactors if the federal government pays for conversion?

Answer: Most of the university reactor operators initially opposed the LEU conversion regulation when it was first proposed in July 1984. The principal reasons for this opposition were twofold: first, there did not appear to be sufficient technical reasons to convert from HEU to LEU fuel given the stated concerns of the NRC regarding nonproliferation of HEU fuel and the diversion of HEU fuel by terrorist groups; second, the universities were concerned that the costs of conversion would not be met by Federal support which would force a number of the reactors to shut down permanently. This latter point is still of concern to many reactor operators since any unexpected conversion costs not covered by Federal support, such as litigation costs or loss of research revenue when the reactor is down for conversion, might force some of the reactors to shut down.

Question: How many universities have agreed to convert to LEU?

Answer: Notwithstanding the overall concerns about the financing of the conversion process, the 20 affected reactors have agreed to convert to LEU although we expect that MIT and the University of Missouri at Columbia will apply for an exemption. Two other facilities, Ohio State University and Rensselaer Polytechnic Institute, are currently in the process of changing over to LEU fuel.

Question: You request $1.9 million for "University reactor fuel assistance." Provide the Committee with a breakdown indicating how these funds will be used including the location of any reactors to be refueled in FY 86 and FY 87 with funding levels.

Answer: The FY 1986 breakdown for the University Reactor Fuel Assistance Program is shown in a table I would like to insert in the record.

(The information follows:)

Reactor refueling MIT University of Missouri, Columbia Pennsylvania State University Rhode Island Nuclear Center University of Lowell University of Virginia	$1,500,000
Reactor sharing grants	300,000
Spent fuel shipping and storage costs	100,000
Total	$1,900,000

We anticipate a similar funding breakdown in FY 1987 with a funding request of $1,900,000, except for the Pennsylvania State reactor which will not need refueling. This schedule will be contingent on the development of our overall LEU fuel conversion plan.

Multiprogram Facilities Support

Question: Explain the need for the 50% increase in this program in FY 87.

Answer: The FY 1987 request for the Multiprogram Energy Laboratory-Facilities Support (MEL-FS) program is $60,190,000, which is $20,366,000 (or 50%) above the FY 1986 request of $39,824,000. The funding levels and increases by subprogram are shown in a table I would like to insert in the record.

(The information follows:)

	FY 1985	FY 1986	FY 1987	Increase FY 87 to FY 86
	(Dollars in Thousands)			
Multiprogram Energy Laboratories-General Purpose Facilities	$33,200	$22,819	$34,935	$+12,116
Environmental Compliance Activities at Oak Ridge National Laboratory	0*	17,005	25,255	+ 8,250
Total MEL-FS Program	$33,200	$39,824	$60,190	$+20,366

*Reprogramming request received final approval April 1985; $5,435,000 was devoted to this activity.

The FY 1987 request for the Multiprogram Energy Laboratories-General Purpose Facilities (MEL-GPF) subprogram will allow the Department to adequately support the rehabilitation and replacement of deficient facilities at the Multiprogram Energy Laboratories

(Argonne, Brookhaven, Berkeley, Oak Ridge and Pacific Northwest). The FY 1987 funding level of $34,935,000 for the MEL-GPF subprogram is 1.3% of the estimated replacement plant value of $2.7 billion for the multiprogram energy laboratories. This level implies a very long, 77 year, replacement cycle for facilities and will do little to reduce the $700 million backlog of projects to correct existing deficiencies. The FY 1986 level for the MEL-GPF subprogram was significantly lower than the FY 1985 level and reflected the need to establish the Environmental Compliance subprogram which address the serious environmental compliance issues at Oak Ridge National Laboratory. The FY 1987 request will return the MEL-GPF subprogram to its FY 1985 level. The MEL-GPF subprogram is an ongoing program reflecting the Department's need to preserve its investment for the planned long term utilization of the multiprogram energy laboratories for Departmental missions.

The Environmental Compliance subprogram provides for the assessment, planning and management of environmental problems at Oak Ridge National Laboratory (ORNL) including the correction of operating systems not in compliance with current environmental regulations and remedial actions for nondefense related environmental problems. A draft long range plan for this subprogram is being prepared.

The increased funding in the FY 1987 request over the FY 1986 request reflects an increase in operating dollars of $4,948,000 and an increase in construction dollars of $3,264,000. The construction increase will allow the start of construction of the Non-Radiological Waste Treatment Facilities project which will correct Resource Conservation and Recovery Act/Comprehensive Environmental Response Compensation and Liability Act (RCRA/CERCLA) deficiencies in the process waste system (liquid). The operating increases will allow the pace of the assessment and characterization activities to increase to a level consistent with Departmental commitments and to address the environmental problems in a timely manner.

Question: Please provide the Committee with a brief table showing all projects planned in FY 87 and beyond to correct environmental problems at Oak Ridge with TEC.

Answer: The most recent planning identifies the following projects for funding by the Environmental Compliance subprogram shown in a table I would like to insert in the record.

(The information follows:)

Year	Project Title	TEC
FY 1987	Continuation of Non-Radiological Waste Treatment Facilities (Project (86-R-801)	$18,000,000
	General Plant Projects	3,000,000
FY 1988	Environmental Monitoring Systems Upgrade	5,300,000
	Low Level Waste System Upgrade, Phase I	38,000,000
	General Plant Projects	4,000,000
FY 1989	General Plant Projects	4,000,000
FY 1990	General Plant Projects	4,000,000
FY 1991	Low Level Waste System Upgrade, Phase II	27,000,000
	General Plant Projects	4,000,000

In addition to the above line item construction projects, a number of corrective remedial actions will be funded from operating expenses (e.g., cleaning up a spill site). The full scope, method of cleanup and cost of these actions cannot be reliably estimated until characterization and assessments are completed in the next several years. It is our plan to give complete visibility to proposed individual expense funded actions as they materialize.

Biological and Environmental Research

Question: For the record, please provide a breakdown of all activities within this program and levels of BA and BO for FY 84, 85, 86, and 87.

Answer: I would be pleased to provide a breakdown of activities within this program for the record.

(The information follows:)

BIOLOGICAL AND ENVIRONMENTAL RESEARCH
BREAKDOWN OF ACTIVITIES
(Tenths of Millions)

	FY 1984		FY 1985		FY 1986		FY 1987	
	B/A	B/O	B/A	B/O	B/A	B/O	B/A	B/O
Source and Dose Determination	12.9	15.1	15.6	15.3	14.8	14.8	16.6	16.6
Environmental Processes and Effects	31.7	33.7	32.4	32.9	29.9	29.9	32.9	32.9
Health Effects	67.0	72.6	63.4	66.8	57.7	57.7	65.9	65.9
General Life Sciences	22.4	25.4	28.5	28.0	27.9	27.9	29.9	29.9
Risk Analysis	1.8	1.8	0	0	0	0	0	0
Nuclear Medicine	20.8	20.5	21.3	21.2	23.3	23.3	22.1	22.1
Carbon Dioxide Research	12.4	11.8	13.1	13.1	12.6	12.6	13.6	13.6
Program Direction	3.3	3.2	3.5	3.4	3.1	3.1	3.6	3.6
Facility Operations	10.7	15.8	9.9	12.9	10.6	10.6	12.0	12.0
Total BER	183.0	199.9	187.7	193.6	179.9	179.9	196.6	196.6

Question: Briefly, outline the benefits derived from the nuclear medicine program and include funding levels for elements of the program for FY 84, 85, 86, and 87.

Answer: Historically, the most noteworthy accomplishment of this program has been to establish nuclear medicine as a major medical specialty. Nuclear medicine is now an essential component of every major medical facility in the country. The national laboratories continue to serve the nuclear medicine community directly by developing and producing many radioisotopes that are not available through the private sector.

The Nuclear Medicine research program is devoted to the development of radioactive tracer methodology for the study of diseases and the development of diagnostic and therapeutic procedures. Federal support and leadership, under the auspices of the DOE and its predecessors, have been responsible for the development of a broad variety of diagnostic and therapeutic procedures employing radiation and radionuclides over the past 35 years. Technetium-99m, one of the most important imaging radionuclides, was developed at Brookhaven National Laboratory in 1960. The physical characteristics of technetium-99m made it nearly ideal for use with the Anger camera, a scintillation detector device, developed at Lawrence Berkeley Laboratory in 1958. This device coupled with technetium-99m labeled radiopharmaceuticals produced a ten-fold increase in the number of diagnostic procedures in nuclear medicine over the decade between 1963 and 1973. Today, the technology developed under this program has resulted in an estimated 100 million procedures annually. Concurrent with the development of short-lived radionuclides has been the growth of Positron Emission Tomography (PET), an imaging device. It provides an unprecedented capability to examine and measure the local biochemical and physiologic changes of the human body. The combination of computer based tomographic (slicing) techniques and radiolabeled natural chemicals such as simple sugards, amino acids and fatty acids permit PET to be used as a safe, non-invasive biochemical microscope that can look inside the human body and examine the life sustaining processes of body chemistry.

Among the most recent developments is the use of radioactive monoclonal antibodies, not only for diagnosis but also in the therapy of metastatic cancer. This method makes it possible to deliver highly localized radiation to cancer cells without harming the nearby normal tissues.

Funding levels for elements of this program are shown in a table I would like to insert in the record.

(The information follows:)

NUCLEAR MEDICINE APPLICATIONS
(FUNDING LEVEL OF ELEMENTS)
(Tenths of Millions)

	FY 84 B/A	FY 85 B/A	FY 86 B/A	FY 87 B/A
Medical Applications of Nuclear Technology	$19.3	$19.6	$21.7	$20.4
Stable Isotopes	1.5	1.7	1.6	1.7
Total Nuclear Medicine Applications	$20.8	$21.3	$23.3	$22.1

Environmental Audit and Compliance

The Secretary's new initiative in this area appears to be concentrated in Environmental Audit and Compliance with the program increasing from $7.5 million in FY 86 to $34 million in FY 87.

Question: Can you give the Committee a better feel for the magnitude of the environmental problem at DOE facilities - both hazardous waste and radioactive waste?

Answer: DOE has a legacy from past operations that extends over forty years. Like companies in the private sector, acceptable practices in earlier times have created today's problems. For example, there is contamination of soil, groundwater, and surface water at Oak Ridge that was caused by past waste disposal practices. Similarly, at Savannah River there is groundwater contamination from past practices. At Hanford, there are potential soil contamination problems related to inactive waste areas that have not yet been characterized. At Idaho, there is groundwater contamination from the past use of an underground injection well. In addition, DOE is in a catching up mode in the RCRA compliance area due to the late start caused by uncertainty as to the application of the statute to DOE facilities. The Environmental Survey is designed to identify environmental problems at DOE facilities and prioritize them for corrective action.

Question: Are you concerned about the efficiency of ramping up the program this quickly?

Answer: The increase from $7.5 million in FY 1986 to $34 million in FY 1987 reflects the increase in the number of DOE sites to be surveyed. Five sites will be surveyed in FY 1986 and twenty sites in FY 1987. The major cost component of the Environmental Survey is sampling and analysis activities. These activities will be conducted by a number of DOE laboratories, and, therefore the ramping up will be distributed among these laboratories and would not pose a problem.

Question: Is most of the survey work contracted out to private firms? (Please provide a breakdown for the Committee.)

Answer: The Survey effort is made up of five teams. Specialized team components (members) will be supplied by a contractor. The numbers of the contractor component on each team will vary from 5 to 10 depending on the site. The team leader and assistant team leader for each team will be DOE employees. A team member from the involved field office will also be a DOE employee. The sampling and analysis portion of the survey activities, which is the major cost component of the Survey, will be conducted by DOE labs.

Cost Breakdown
($ in millions)

	FY 1986	FY 1987	FY 1988
Contractor Survey Team Components	$ 1.5	$ 2.0	$ 1.5
Sampling and Anaysis	6.0	28.0	21.0

Question: Why is it necessary to complete the baseline Environmental Survey in 3 years?

Answer: The present schedule for the conduct of the Survey would have it completed in FY 88. The Survey will enable DOE to identify problems and prioritize remedial actions on a Department-wide basis. The more quickly the Survey can be completed, the sooner these desirable ends can be achieved.

Question: Are you withholding environmental cleanup of obvious problem areas to await the survey which will prioritize corrective action?

Answer: No ongoing or planned cleanups are affected by the Survey. On the contrary, the Secretary has directed that these efforts by all means continue. In addition, the Department is prepared to immediately address any cleanup requirements which become apparent during the Survey period.

Question: What guidance is given to line management through the operations offices with respect to existing cleanup efforts and environmental problems which are clearly high priority?

Answer: As indicated in response to the previous question, the Secretary has directed line management that the Secretary's initiatives, including the Survey are in addition to these ongoing and high priority cleanup and that these efforts are to continue. As for efforts to identify environmental problems, these likewise are to continue, except to the extent that they can be folded into the Survey.

Question: As stated on page 42 of House Report 99-307, the Conference Report to accompany H.R. 2959, the conferees provided $2.9 million for LEU fuel assistance to universities in FY 1986. Please indicate how you plan to allocate these funds and describe any specific problems at any particular reactors which may need funds in FY 86 for other than LEU assistance. (include levels of funding at each reactor site)

Answer: The "Joint Explanatory Statement of the Committee of Conference" contained in House Report 99-307 contains a table on page 52 which shows that $2,000,000 was provided for LEU fuel conversion. This funding for FY 1986 is being allocated as shown in a table I would like to insert in the record.

(The information follows:)

Gramm-Rudman-Hollings reduction	$ 76,000
LEU fuel fabrication for FY 1986	350,000
Shipment of fresh HEU fuel from university campuses to DOE	80,000
ANL technical support for universities studying conversion	125,000
National Academy of Sciences study on the role and future of university reactors and the impacts of LEU conversion	186,000
Safety analysis studies for five universities in anticipation of conversion to LEU fuel	555,000
Certification of spent fuel shipping cask for transportation of university fuel	100,000
Total	$1,472,000

The process of receiving a proposal from the affected universities and getting a grant in place to provide the financial support for the studies will require four to five months. Therefore, we are currently looking at the feasibility of carrying over the balance of funding to continue supporting the safety studies at another three to five university reactors in FY 1987.

The existing fuel assistance budget of $1.9M for FY-86 supports a variety of related needs in addition to fuel procurement, such as the shipping of spent fuel and reactor sharing. No additional funds are requested or anticipated for FY-86.

Question: Outline the funding options and schedules which are being developed following your March 12 meeting at Argonne.

Answer: As a result of the Argonne meeting with the universities, NRC, the fuel fabricator and EG&G we have developed a three phase conversion plan. The first phase involves the university providing DOE with a proposal that details their internal costs for preparing a safety analysis study and request to NRC for conversion. DOE will review this request and provide a grant to cover those costs. The estimated time period for this first phase is eight to ten months. The second phase will begin when the university submits their safety report and request to convert to NRC. During this phase DOE will issue a contract for procurement of the fuel when NRC indicates the conversion is essentially approved. This phase will probably require a six to eight month time period. Phase three will begin with issuance of the NRC Order to convert. At this time DOE, in coordination with the university, will make arrangements for exchange of the fuel. The time estimate for this phase of the operation is also expected to be about six months.

The current schedule and funding plan for conversion of university reactors is considered to be the most efficient and economic use of resources in light of the various actions required in the process. The only options apparently available are to increase or stretch out the conversion process. Any significant increase would entail fuel production problems at the fabricator. Unnecessary delay would, on the other hand, involve additional costs.

Question: List the 5 universities which will receive safety analysis study funding, the amount for each university, and type of research reactor, the proposed completion data of the study and specifically the need for the study at each site.

Answer: The universities scheduled to receive support for their safety analysis studies this fiscal year are shown in a table I would like to insert in the record.

(The information follows:)

University	Reactor Type	Est. Completion Date
U. of Virginia-Cavalier	Training-100 watts	10 months after start
U. of Missouri-Rolla	Training-200KW	6 months after start
Worcester Polytechnic	Training- 10KW	6 months after start
Rhode Island Nuc. Sc. Ctr	Research- 2MW	18 months after start
U. of Lowell	Research- 1MW	12 months after start

Proposals have not yet been received from these universities, therefore, the amount for each university is not known at this time. The reason that each reactor facility requires a specific study is because they have all been individually reviewed and licensed based upon detailed operational and safety information submitted by the university operator. The technical specifications and operational characteristics vary slightly in all of these reactors. These analyses and calculations are carried out to assure the reactor will continue to operate within the established margins of safety. These studies will also provide the basis for NRC review and issuance of a specific order for conversion.

Question: Provide a breakdown of the $350,000 for LEU fuel fabrication in FY 86 among the recipient universities.

Answer: The $350,000 for LEU fuel fabrication in FY 86 is for a full core at Ohio State University-$250,000 and for fuel replacement for the University of Michigan-$100,000.

Question: Please list the universities which will benefit from the $80,000 for shipping and storage of HEU fuel.

Answer: The following is a list of the universities from which HEU was returned to DOE in accordance with the NRC "show cause" Order.

University of Kansas
Penn State University
University of Wisconsin
Virginia Polytechnic Inst.
Iowa State University
Purdue University
University of Florida
Georgia Tech
Univ. of Washington
University of Virginia

Question: Describe in detail the process, current status, funding requirements and expected completion data for conversion of reactors at 60th Ohio State University and Rensselaer Polytechnic Institute.

Answer: In response to requests from Ohio State University and RPI for facility improvement and conversion of their reactors to LEU in FY-85, grants were issued to each in July and August 1985, respectively. We understand that these studies are progressing satisfactorily and will probably be concluded and ready for submission to NRC before the end of the summer. At that point we will be into, what may be termed, phase two of the conversion cycle. We expect it will be near the end of 1987 before conversion is complete at Ohio State University and RPI.

Question: Has the University of Michigan, Ford nuclear reactor, been converted to LEU? Please explain the process which was used to convert this facility; include a description of the type of reactor, the cost of conversion and any problems which occurred. What activities are planned at Michigan in FY 86 and FY 87?

Answer: The University of Michigan, Ford Nuclear Reactor has been converted to LEU fuel. This conversion was carried out under the auspicies and support of the RERTR Program, funded by the Office of Nuclear Energy, as a full core demonstration project. The process followed for conversion was as follows; the University of Michigan developed a license amendment containing all of the necessary safety calculations that were carried out on the fuel and test elements in the reactor and submitted this to NRC. The NRC reviewed and approved the amendment and the University proceeded with a partial and then a full core change of the fuel. The whole process, including removal of the HEU fuel took approximately five years. The cost was approximately $600K which included some computer code development and experimental programs, i.e. flux measurements in beam tubes and control rod worth, that would be useful at other facilities. No major problems were encountered in the conversion. Plans for FY-86 and FY-87 are for normal operation relative to the conversion program. There will be some minor studies done to change the Michigan fuel to a standard plate using the silicide fuel matrix instead of the aluminide.

Question: Please describe in detail the current schedule for conversion of plate-type reactors at Rhode Island, Lowell and Virginia.

Answer: We expect to receive proposals from Rhode Island, Lowell and Virginia within the next four to six weeks, in which case an assistance grant would be authorized and issued by the DOE Operations Office by July or August. Since the U. of Virginia will be converting two reactors, it was planned to start first with the smaller training reactor the 100W Cavalier since this fuel is not "self-protecting", i.e. 100R/hr at 3 ft. It is expected that the first phase, safety analysis study, will be completed about ten months after the start date. Phase II will require about five to six months, with a estimated completion date of September '87. The fuel exchange process, or phase III, would then take place in the fall or early winter of 1987. We expect that the University of Lowell conversion cycle would follow approximately the same timing pattern. The Rhode Island Nuclear Science Center would take somewhat longer in the initial phase due to additional studies related to changes in fuel loading and emergency core cooling requirements. It will probably be near the end of 1987 before RINSC will be ready to submit a licensing change package to the NRC. We anticipate that RINSC would be ready to make a fuel change in the fall of 1988.

Question: What activities are scheduled or foreseen for the facilities at Georgia Tech?

Answer: Since all of the unirradiated HEU fuel at Georgia Tech has been moved to a DOE facility and they have an adequate supply for several years, we do not anticipate initiating safety analysis studies until the fall of 1987. This would place them on a timing schedule to effect conversion in the fall of 1989.

Question: Why has Pennsylvania State University been added to your list of reactors for assistance in FY 86 and FY 87? Please provide the Committee with a full description of this reactor, the funding and activities scheduled, and the need for proceeding with these activities.

Answer: Penn State University has a TRIGA Mark III, pool type, light water moderated, research and training reactor that uses 20% enriched U-235, rod type fuel. Periodically the university has needs for additional fuel. Eight fuel rods at a cost of $50,000 were provided in FY-86 to fill this requirement. This TRIGA rod-type fuel is purchased from General Atomics in San Diego, CA. Penn State has one of the more active university nuclear education programs in the country ranging from nuclear engineering graduate studies to public and community education. Penn State has participated in the DOE Reactor Sharing Program for many years with special emphasis on high school programs that qualify secondary school teachers to teach nuclear science. During the school year 1984-85 9 colleges and 52 high schools participated in the program that involved 66 faculty and over 1000 students.

Question: What activities are planned in FY 86 or FY 87 at the University of Illinois and the University of Texas?

Answer: The University of Illinois is currently participating in the DOE reactor sharing program and has submitted a proposal for renewal for next academic year. The University of Texas is in the process of building a new reactor facility at a research park a few miles from the current university campus. Additional TRIGA fuel was provided to the University of Texas in 1985 when the Northrup Triga reactor was shut down. This fuel, which had little use, was donated by the Northrup Corp. No special DOE programs are anticipated at this time.

Question: Explain your procedure and the timing for certification to the NRC that funding is available for conversion, particularly at the universities scheduled for activities in FY 86 and FY 87.

Answer: Discussions are underway with NRC to coordinate procedures for certification of funding or lack thereof. We expect that issuance of a grant to the university to start their reactor safety studies would constitute certification of funding. For those reactors that would not start their safety studies until after March 27, 1987 we would propose sending them a letter informing them of the time frame that they could expect funding for their conversion studies. As indicated, this is to be discussed and agreed to with NRC.

Question: What is your plan for conversion of the TRIGA-type reactors?

Answer: The four TRIGA reactors using the FLIP 70% enriched fuel would be considered for conversion after the plate-type reactor conversions are all underway. Since removal of nearly all unirradiated HEU fuel from the university reactors has been concluded, we do not see any urgent need for rushing these conversions. These facilities operate at a power level of 1MW with the fuel in the core highly radioactive, which make them a highly unattractive target for theft. With a replacement cost of $750,000 for fuel only for each reactor it appears to be an unwise use of existing resources to discard perfectly good reactor fuel at this time.

Question: Provide a more detailed breakdown of your $1.9 million request for fuel assistance in both FY 86 and FY 87 with a funding level for each university and a listing of all reactor sharing grants.

Answer: Estimates for the $1.9M university reactor sharing and fuel assistance program for FY-86 and FY-87 are shown in a table I would like to insert in the record.

(The information follows:)

Item	FY 86 Est	FY 87 Est
Gramm-Rudman reduction	$76,000	
Heavy Water Reprocessing	25,000	$ 25,000
EG&G Program Admin.	70,000	100,000
Uranium Metal	37,000	40,000
Uranium/Aluminide Powder	54,000	50,000
Equipment Upgrade for Fuel Fabrication	216,000	150,000
Missouri Fuel Elements	360,000	380,000
MIT Fuel Elements	128,000	150,000
U. of Michigan	-	150,000
U. of Illinois	-	150,000
Penn State	50,000	-
Rhode Island	150,000	-
U. of Lowell	50,000	-
U. of Virginia	100,000	-
Spent Fuel Shipping	100,000	100,000
	$1,416,000	$1,295,000
Reactor Sharing Proposals under Review	600,000	600,000

The FY-86 reactor sharing grants are listed in a table I would like to insert in the record.

(The information follows:)

University	Grant
University of Florida	$20,000
Georgia Institute of Technology	30,000
Kansas State University	5,500
Massachusetts Inst. of Technology	50,000
University of Maryland	12,000
University of Michigan	25,000
University of Missouri-Col	65,000
University of Missouri-Rol	12,000
North Carolina State University	5,000
Ohio State University	20,000
Pennsylvania State University	4,800
Reed College	8,500
Texas A&M University	30,000
University of Virginia	10,500
Washington State University	20,000
University of Wisconsin	12,000
Purdue University	2,400
University of Illinois	10,000
State U. of New York, Buffalo	18,000
Oregon State University	10,000

QUESTIONS SUBMITTED BY SENATOR COCHRAN

Mendez Foundation

Question: Dr. Trivelpiece, in the FY 1986 Department of Energy Appropriations Act, $1.5 million was provided for a cooperative program involving the Lawrence Berkeley Laboratory, the Ana G. Mendez Education Foundation, and Jackson State University. For years, these organizations have been involved in a productive relationship which has served to enhance computer science, scientific research, and academic programs.

Recognizing that the FY 1986 adjustments required by the Gramm-Rudman-Hollings sequester has had an impact on implementation of this year's funding allocation, could you give this committee an update as to the current status of this program?

Answer: We received the formal proposal on March 7, 1986, from the Jackson State University/A. G. Mendez Educational Foundation/Lawrence Berkeley National Laboratory consortium. The proposal requests $1,500,000 from the Department to initiate support for the upgrading and strengthening of the mathematics and science teaching capabilities and programs at both Jackson State and the three colleges in Puerto Rico which are affiliated with the Mendez Foundation. Technical and other assistance in this process would be provided by scientists and staff at the Lawrence Berkeley Laboratory. A major element of this proposed program would be research and teaching internships at the Lawrence Berkeley Laboratory for faculty members and students at the participating universities.

This proposal is currently undergoing peer review by science education experts in other Federal agencies and in private foundations. Suggestions and comments from these reviewers will be sent to the consortium members for incorporation, as necessary, in a revised proposal and program plan. We anticipate that this process will be concluded by mid-May.

Question: Your statement indicates that this type of program is included in the University Research Support request for FY 1987. What are the plans for this particular program for FY 1987 and the future?

Answer: The FY 1987 budget request for the Office of Energy Research does not include any funds specifically directed at the continued funding of this program. We do have $300,000 included in the budget request for continued "seed" support for cooperative programs involving our national laboratories and minority colleges and universities. We believe that the longer term financial support requested by the Mendez consortium should more properly be considered by private foundations and/or the Department of Education and the National Science Foundation, agencies with more direct responsibilities than DOE for undergraduate science education.

QUESTIONS SUBMITTED BY SENATOR MCCLURE

Basic Energy Sciences

Question: Funds are provided for advanced studies for an advanced steady state reactor in the 1987 budget, and a siting decision appears to have been made as part of the Internal Review Budget process that would put the reactor at the Oak Ridge National Laboratory. Did the Department follow the NEPA process in making this siting decision?

Answer: The Department fully intends to meet the requirements of the NEPA process prior to taking significant federal action on this project.

Question: Has this siting proposal been put before the DOE Energy Systems Acquisition Panel for its review and decision?

Answer: The Department considered the various proposals for new facilities presented to it and the recommendations of the ERAB to proceed with certain new scientific facilities. It was the Department's decision to site the various facilities at the best possible location considering each laboratories' expertise, past experience, interest, and ability to carry out the objectives of the facility project. This decision was an internal DOE management decision and all procurements associated with this decision will follow the normal Department requirements.

Question: Has the Department made a study of the construction and operational costs of this facility comparing remote sites with populated areas?

Answer: The Department did not make a study of the operational costs of this facility comparing remote sites with populated areas. The site decision was based on a management judgment concerning the best location for an advanced research reactor considering the ORNL wide ranging experience building and operating research reactors, their base of research ongoing related to the activities to be undertaken at the new reactor such as neutron scattering, radiation effects, isotope production, and their base of knowledge achieved in conducting research and development on the reactor design.

QUESTIONS SUBMITTED BY SENATOR DECONCINI

Solar Energy Overview

Question: Last year this committee expressed that it is essential that a viable solar and renewable energy research and development program be maintained in the Department of Energy and that the staff expertise be maintained to properly manage this type of effort. How do you plan to accomplish these goals at the same time that you propose reducing the funding levels for these programs by 50%?

Answer: In each of the applied research and development areas, the need to accomplish reduced Federal outlays has prompted the Department to critically examine every funding proposal. No area of research and development has evaded this review process. In the case of renewable energy, the proposed reductions in new budget authority reflect a variety of considerations including the successful culmination of previous research efforts, a concentration of public investment in the more basic research areas appropriate to the Federal role and tough business decisions among competing technical priorities. The Departmental request for renewable energy reflects a commitment to sustaining a balanced effort among the renewable energy technologies options in a manner which focuses expenditures on the highest priority for scientific and technical investigations.

Question: This is the third year in a row that this Administration has proposed severe cuts in the solar and other renewable energy programs. Do you plan to continue this trend in the outyears?

Answer: While annual resource availability may have varied the overall technical priorities for renewable energy have remained relatively constant over the past several years. The need to reduce Federal deficits has required a further focussing of Departmental proposals on those technical priorities most suited to the Federal role in energy research. These core priorities have remained essentially constant from FY 1985 to FY 1987 and will remain so for the foreseeable future. The proposed FY 1987 budget is part of an overall Federal budget, including outyears, that will meet the Gramm-Rudman-Hollings targets. The outyear projections show a constant purchasing power for the programs at the requested FY 1987 levels.

Question: Do you have any reason beyond the general catchall of deficit reduction for continuing to slash the funding for these programs?

Answer: In addition to the first priority of deficit reduction, renewable energy programs have also been reduced in some cases due to the orderly conclusion of a number of larger engineering development projects which were initiated in prior years. Renewable energy technical progress also has been paralleled by an increasing level of confidence in and commitment to renewable technologies by the private sector. This commitment and confidence is reflected in the development of a group of many small diversified renewable energy businesses and the creation of sizeable divisions of large companies. Utilities, institutions, and States have become increasingly involved with promoting and conducting R&D programs to further advance the knowledge of renewables. Therefore, Federal funding has been limited in those areas where considerable interest has been shown by nongovernment entities. Federal dollars have been focussed on the highest priority research to address the most critical technology base issues which have the greatest relevance and potential for future private sector development.

Question: What evidence, if any, do you have to show that the private sector will not react to the reduced funding level in a like manner; i.e. by slashing or cutting back their own efforts in direct and applied research?

Answer: The Renewable Energy industry is comparatively new and is extremely broad in scope ranging from elements of established major industries to more entreprenurial interests dedicated to pursuing individual technologies. Data concerning the specific financial capabilities and intent of individual firms is both proprietary and comparatively sketchy and assessments of industrial capability must therefore represent professional judgements on our part based on our ongoing dialogue with industry counterparts. However, it is our view that industrial interests will remain high in solar R&D projects even though the DOE funding requests are being reduced. It is expected that the technical progress which can be accomplished under public and private investment will maintain a competitive domestic industrial base.

Question: What is your assessment of the impact that the reduced funding levels will have on our international leadership role in the solar and other renewable energy fields?

Answer: The reduced funding level for solar and renewable energy is not expected to have an impact on the U.S. international leadership role. We believe the domestic renewable energy field currently has a competitive edge on the international markets and this trend should continue due to the increased interest in solar and renewables by the private sector in recent years.

Solar Building Energy Systems

Question: Your budget submitted proposes a $3,481,000 reduction for solar buildings energy systems compared to FY86 levels. What solar buildings programs will not be funded in FY87 or will receive significantly lower allocations as a result of these reduced funding levels?

Answer: The budget reductions are distributed among both the materials and components, and the systems portions of the solar buildings program. In materials and components, research on thin film/polymer and compound parabolic concentrator collectors will be reduced. Research on thermal transport materials and closed-cycle absorption cooling will also be reduced. Thus, the primary areas of research will be in apertures and building surface materials, and in open-cycle cooling. Systems research will be reduced, primarily in the area of daylighting systems that use available technology. Systems research will retain its focus on the full-scale testing of advanced component assemblies for daylighting, cooling and heating.

Solar Building Energy Systems

Question: Could you please identify what specific funding levels have been included in your request for open cycle solar cooling research in FY87.

Answer: The Department's FY87 budget request includes $800,000 for chiller and desiccant materials and components research. Specific activities are: fabricate and test several open cycle absorption chiller including an integral collector/regenerator, and monitor and evaluate operation of prototype systems. These activities include open cycle solar cooling research.

Question: What specific amount has been identified for continuation of the three year three phase open cycle solar cooling contract with Arizona State University.

Answer: Arizona State University is now conducting the first two phases of its open cycle solar cooling research contract. Upon completion of these phases of the contract, the Department will review the research results and determine the funding required for work in Phase III.

Question: Is the funding level that you have proposed sufficient to complete the contract with Arizona State University within the originally specified time frame?

Answer: The proposed level of funding is adequate to complete the Arizona State University contract, provided that the review of the first two phases of the contract support its continuation.

Question: To your knowledge would Arizona State University be able to effectively utilize a higher level of funding on this project than you have proposed? If yes, what is that level?

Answer: The proposed level of funding for open cycle solar cooling research is adequate to accomplish the program's research goals and objectives of the present Arizona State University project.

Photovoltaics

Question: What effect will the dramatically reduced funding level that you have proposed for FY87 have on the DOE Five-Year Research Plan that you have already committed to with the photovoltaic industry and research community?

Answer: Many important milestones in the five year plan will be pursued as vigorously as in prior years; some will be stretched out. Many of the activities are no longer needed since industry has matured sufficiently to pursue these without government support (examples are silicon material, silicon sheet, and flat plate silicon module reliability). Other activities will be stretched out to allow more fundamental work to be completed before pursuing application-oriented research. Typical fundamental studies include amorphous silicon light-induced degradation, improved deposition technology for all thin-film devices and improved materials measurement technology.

Question: Your budget statement indicates that it is this Administrations policy to concentrate on longer-term research and development and to withdraw from continued efforts in more mature technologies. Does the photovoltaic industry and research community agree with your assessment that photovoltaics is now a sufficiently developed technology to warrant significant reduction of base research funds in this area?

Answer: The various members of the photovoltaics community have different views on the DOE assessment ranging all the way from (a) do nothing other than very fundamental research to (b) help the industry by purchasing large quantities of finished products. The DOE PV program for FY 1987 is in-between these extremes and will pursue both basic research and applied research associated with thin-film photovoltaic devices. The selected areas of research have broad-based industry support.

Question: What percentage of the proposed funding for photovoltaics will go to applied research and demonstration projects versus basic research such as materials development or development of corrosion inhibitors?

Answer: No funds are planned for demonstration projects. The funds will be divided approximately 50:50 between basic research and applied research.

Question: What is the specific funding level proposed in your budget for continuation of the photovoltaic research effort currently sponsored by Sandia National Laboratories and conducted by Arizona State University?

Answer: The Sandia National Laboratories has been supporting Arizona State University (ASU) for many years in the testing of concentrator cells and modules. In late FY 1985, the ASU was funded for $83,000 to continue this work until January 1987. At the end of FY 1986, continuation funding will be considered for this contract for an additional year of effort.

Cogeneration

Question. What work, if any, is DOE doing in the area of cogeneration (use of fossil fuel exhaust gases to generate thermal heat)?

Answer. DOE is conducting research and development on improved cogeneration systems that either have improved conversion efficiencies, provide increased electrical to thermal output ratios, or provide fuel flexibility.

Industrial cogeneration activities have been reduced from the FY 1986 activities. Work on the externally fired Brayton will be concluded at the end of FY 1986. The Thermionics direct conversion work and the sodium heat engine development will continue. A 1000 watt unit of the latter will be fabricated.

The successful combustion of coal in a diesel has been achieved in a test installation. Wear studies are to be conducted, and the initial design of a test facility is being prepared.

The externally fired Brayton development has concluded its topping combustor test that would allow the fluidized bed-gas turbine system to reach full temperature.

Laboratory tests of an advanced high temperature steam turbine system will continue, allowing a 70% increase in electrical output from a cogeneration system.

The bottoming cycle research will be concluded in FY 1986. This includes evaluation and improvement of working fluids and an advanced prime mover that has low projected costs.

Question. It is my understanding that some phases of the cogeneration technology are about to move toward commercialization. What role is DOE playing or planning to play in the development of operating standards for the co-generation industry?

Answer: DOE is not playing or planning to play any role in the development of operating standards for cogeneration. This is considered a commercialization function. We do from time to time participate in developing technical design standards which is consistent with our research and development function.

The Cogeneration Research Institue, which will be dedicated in Tempe, Arizona next month, will formulate operating standards for cogeneration. The Institute will be housed in Arizona State University in Tempe.

Solar Thermal

Question: As you may be aware, several Western and Southwestern electric utilities have had a long-standing interest in solar central receiver technology. About a year ago Arizona Public Service Company, Pacific Gas and Electric Company and Southern California Edison Company submitted a proposal to your for funds to pursue three coordinated studies which, upon completion, would help define the most appropriate steps to commercialize solar thermal technology. Specifically, these coordinated studies would define: the most cost-effective systems and a baseline commercial plant concept; the most timely and cost-efficient means of eliminating technical risks; the most appropriate steps for commercialization; and the most prudent use of existing facilities to support commercialization. Would you please advise me as to the action DOE contemplates taking with regard to the proposal submitted by these three companies?

Answer: The proposals have been favorably reviewed and the Department is proceding into negotiations with the three utilities. It is anticipated that cooperative agreements will be implemented this summer.

Question: Are any specific funds earmarked in the FY87 budget for research of the nature proposed by APS, PG&E and Southern California Edison? If funds are identified please describe the specific project(s) for which they are intended.

Answer: The proposals are for performing the studies in two phases: 1) definition of a baseline commercial plant concept and 2) a technical plan for eliminating technical risks. Cooperative agreements are currently being negotiated and therefore, funding requirements are not finalized. The first phase will be completed in early FY 1987. The final scope of phase 2 will depend on the results from phase 1. An assessment of program priorities will be made at the conclusion of phase 1 regarding the initiation of the phase 2 studies.

Question: Do you now consider solar thermal energy systems to be a mature technology and does the solar thermal energy systems industry and research community agree with your assessment of the status of the technology?

Answer: Some types of solar thermal systems are already enjoying commercial investment, such as the parabolic trough collector systems installed by Luz for Southern California Edison. Technology development is proceeding well in central receivers. Subsystems and components are being built to substantiate the research program results. Several years of additional development and testing is still required to verify technology status. Issues still remain concerning efficiencies, lifetimes and scale. Proof of concept at scale and integrated operation are still two key issues which must be answered before the technology can be considered mature. The utility public planning studies are a deliberate attempt to obtain industry and the research community assessments of the status of the technology. Utilities are all watching the experience in Southern California regarding the comparative performance of parabolic trough/tube receivers versus central receivers.

Distributed (i.e. dish) systems still require development of technology for efficient and reliable engines. Research and development is proceeding to reach a status that will promote industrial development. Certain engines (i.e. Stirling) are being developed by industry but other engines with the potential for higher reliability and performance require further development.

Superconducting Super Collider

Question: As you know, Arizona is quite interested and supportive of the SSC project. Those of us who are supporters of the SSC realize the many ramifications and potential benefits of the project, and we recognize the need for basic research if the U.S. is to regain its technological edge. What will be the keys to building on the momentum of support that the SSC is gaining? How can those of us who recognize the need for the SSC see that it is built in this country?

Answer: As discussed earlier, the Secretary is planning to reach a decision this summer on whether to seek authorization for construction initiation of the project in FY 1988 or some future year. If the decision is to go forward and the President endorses the project, the project will clearly benefit from the support and enthusiasm the project is now receiving from the public to successfully proceed through the authorization, site selection, and construction processes. We appreciate very much this initiative and support.

Question: One of the primary issues of the SSC is the multidisciplinary research and spin-off developments that would occur; i.e., the SSC means not just high energy physics but also cutting edge technologies in computer science, engineering, underground construction and tunneling, superconductivity, robotics, etc. Do you think there is a realization of the true magnitude of the potential benefits?

Answer: Indeed, the SSC would be involved with cutting edge technology in all of the areas you mention, the spin-offs from the SSC at the cutting edge of technology have already begun. For example, as part of the SSC R&D, superconducting wire performance has already been substantially improved by about 50 percent over the wire available for the Tevatron magnets. Superconducting wire is used in many new areas of technology, including the fabrication of large magnets required for advanced methods of medical diagnostics. The improved superconducting wire will make these magnets cheaper and more readily available. The SSC would also play an important role in education and training, providing outstanding research challenges to a generation of science and engineering students. The benefits from past basic research permeate every aspect of the nation's well-being and security. It is exceedingly difficult, however, to predict ahead of time the discoveries which will proceed from basic research and advanced technology activities like high energy physics, much less the extent of the benefits which will result.

Question: We know that many of the engineering and science graduate students studying in our universities are foreign nationals who will return to their own countries once their educations here are finished. There is little doubt that the U.S. is losing its lead in basic high technology and science, and we are not producing the graduate students to ever help us regain that lead. In light of this doesn't it seem that it is essential for the U.S. to do all it can to promote basic research and scientific development and isn't the SSC a crucial component to starting that effort?

Answer: The SSC would certainly be a very important element, along with other basic research activities, in the carrying out of forefront research and in the education and training of the nation's future scientists and engineers. The scientific attraction and technological challenges of the SSC can be expected to attract some of the most outstanding of the nation's young people into careers in science and technology and also will provide a rigorous training ground.

Question: From a technical standpoint, how well do these superconducting magnets function and how reliable are they in quantity?

Answer: The design, fabrication, and successful testing of many models of several different styles of superconducting magnets, as part of the SSC R&D program, confirm that this new technology is adequately mature and well-understood to be the basis for the SSC facility. The field uniformity and field strength of the magnets are excellent and fully predictable. The quality of the magnets is enhanced by the success in first understanding and then improving the quality, reproducibility, and manufacturing characteristics of the superconducting wire. These are key factors in the cost and reproducibility of the magnets and major improvements have been made as a result of a DOE supported collaborative university/laboratory research effort with U.S. industry. Reliability and quality control are critical factors in a complex project of this magnitude. They will be addressed in the Conceptual Design Report and emphasized throughout the design, construction, and operation of the facility. The successful operation of the Tevatron for several years now with its nearly 1000 superconducting magnets, adds to the credibility of and confidence in this new technology.

Question: What are the economics involved in SSC; i.e., will the prices for these superconducting magnets escalate, can DOE cover the remaining planning costs within its proposed budget, etc.?

Answer: It appears that the estimated costs for the SSC by the Central Design Group are generally consistent with those of the Reference Designs Study (RDS) and perhaps somewhat lower. The R&D of the past two years has successfully verified the critical technical assumptions of the RDS and shown that the earlier estimates were based on a good foundation. The Conceptual Design Report, due in April, will contain a new detailed, bottoms-up estimate of the SSC construction costs which will be carefully reviewed by the Department. Relative to funding needs and the need for a supplemental request for SSC R&D in FY 1987, we believe that by focusing on the most critical SSC R&D requirements, the highest priority FY 1987 needs for SSC R&D can be accommodated within the high energy technology budget where it was funded in FY 1985 and FY 1986.

Question: What plans are there for further building at CERN, beyond the use of superconducting magnets in the existing tunnel?

Answer: The only firm future plans at CERN are related to Phase II of the Large Electron-Positron, LEP, facility, which is to upgrade the energy of LEP to the 100-120 GeV per beam range. This upgrade is planned to immediately follow Phase I which will be completed in 1989. Considerations of future facility construction at CERN beyond Phase II of LEP, including the possibility of a hadron collider using superconducting magnets in the LEP tunnel are being studied by a European committee which is not expected to report its results until 1987. It is premature to speculate on what CERN might decide to do.

Question: Are there other plans for major new high energy physics facilities (aside from Stanford and DESY)?

Answer: There are no plans for a major new high energy physics facility at Stanford beyond the Stanford Linear Collider, SLC, which is currently under construction. The Stanford Linear Accelerator Center, SLAC, is pursuing, at a modest level, generic advanced accelerator R&D studies to investigate a number of promising new accelerator technologies one or more of which might make possible a new generation of accelerators in the next century. At this time, there are no specific facility plans. A High Energy Physics Advisory Panel, HEPAP, subpanel recently studied the U.S. advanced accelerator R&D progress and concluded that these new concepts, although promising, would not be ready to be incorporated in a facility for 15-20 years. A Jason Study reached essentially the same conclusion. I would like to submit a copy of the HEPAP Subpanel report for the record. Elsewhere in the world, besides CERN which I just discussed and DESY which you mentioned, the only other firm accelerator plans are related to the UNK facility under construction at Serpukhov in the Soviet Union. UNK is planned ultimately to provide a 3 TeV fixed-target facility and a 3 TeV per beam proton-proton collider in the early to mid-1990's.

(NOTE: The information referred to was placed in the subcommittee files.)

QUESTIONS SUBMITTED BY SENATOR JOHNSTON

International Cooperation on Physics Accelerators

Question: The cost of building new accelerators has reached several billion dollars. One way to cope with such costs is sharing the cost of new accelerators with other countries. What is DOE's goal, in terms of international competition, in high-energy and nuclear physics (leadership, maintain a competitive position . . .)?

Answer: The Department's goal is for the U.S. to maintain a world-competitive position in high energy and nuclear physics. It is important in basic research activities like high energy physics and nuclear physics that the program be of highest quality and have the capability and opportunity for discovering new insight and breakthroughs in understanding. This requires that the U.S. program have world-competitive capabilities and that some of the world-forefront facilities be located in the U.S.

Question: What are the constraints limiting greater international cooperation and cost-sharing? How many of those constraints result from the competitive nature of international physics programs?

Answer: The constraints are largely political and economic. It is difficult enough to get political, scientific, and budgetary agreement on large new facilities in a single country. Getting simultaneous agreement from several countries is much harder. Fortunately, in high energy physics there is a long and substantial history of successful international cooperation on experimental facilities. A new model for international collaboration on high energy accelerator facilities is given by the construction of the Hadron-Elektron-Ring-Anlage (HERA) at DESY (Hamburg, Germany). The German government made a commitment to the construction of this facility, and international participation in this construction was then successfully sought from other countries. The international participation by other countries is in the form of providing technical hardware needed for the faculity. For example, Italy has agreed to supply half the superconducting dipole magnets. With the German government first committing to the project, the problem of obtaining simultaneous agreement from several countries was avoided. Successful high energy physicists and institutions are highly competitive within the country and within a laboratory, as well as internationally--they strive hard to excel. Nonetheless, there is also an excellent spirit of cooperation between both individuals and institution's for the advancement of the science, resulting in a spirit of openness and cooperation in the field. For example, the new antiproton source at Fermilab that is part of the Tevatron I project benefited immensely from the earlier experience at CERN which was freely made available to Fermilab which also benefited from direct ideas and contributions from Soviet physicists. In turn, CERN is now benefiting from the new ideas, modifications and techniques developed by the Fermilab in improving the CERN source. In order to maintain a strong, forefront program, it is recognized that each major world region must maintain frontier experimental capability. Worldwide coordination and cooperation is in place to ensure that these large facilities are complementary, rather than duplicative. It should be noted that it has been formal practice for many years throughout the world of high energy physics that unique forefront accelerators in one area provide beam free of charge to scientists on the overall scientific merit of their proposals and without regard to nationality. Thus, U.S. scientists are using unique European and Japanese high energy physics facilities without charge for beam time and vice versa.

Question: What has DOE achieved in terms of international cost-sharing arrangements?

Answer: Major world facilities both in the U.S. and abroad are available to scientists of all nations based on the scientific merit of their proposals and without charge for beam. This mutually beneficial access to foreign facilities which have unique capabilities not available in the home region constitutes a major form of international cost sharing. There is also substantial cost-sharing in the fabrication of large experimental facilities. To pick two recent major examples, the Japanese and Italians have contributed substantially to the Collider Detector at Fermilab (CDF), in excess of $12.5 million and $5.0 million, respectively. Meanwhile, the U.S. is contributing about $24 million of equipment toward the collaborative LEP-3 detector for use at the CERN Large Electron-Positron collider. The cost sharing with Japan and the Soviet Union is covered primarily under formal agreements of cooperation between governments, while that with Western Europe is arranged on a less formal laboratory-laboratory basis.

Question: Electron and proton accelerators have often been used to explore similar areas of physics. For example, the J/PSI particle was independently discovered at SPEAR (a collider) and at the Alternating Gradient Synchrotron (a proton accelerator). If both electron accelerators and proton accelerators are capable of exploring the same areas of physics, are we funding duplicative machines?

Answer: No, we are not funding any duplicative machines. Each machine that is built has unique capabilities where it alone can function and is complementary to the others. This uniqueness may reside in the mass region it covers, the type of process it probes, or some special characteristics of its beams. There are many areas of physics that can only be probed by one type of machine. In addition, there are some areas of physics which can be accessed by more than one machine. However, in these cases, the electron and proton machines access the physics with different probes and provide complementary, not duplicative, information. The discovery of the J/psi is a good example of this complementarity. While the Alternating Gradient Synchrotron, AGS, was a good machine for discovering this particle, it was a very poor machine to do follow-up studies to ferret out the detailed properties and broader implications of the J/psi. On the other hand, the SPEAR collider, using a different probe, was a difficult machine on which to initially discover the J/psi but was ideally suited for the followup studies. The fact that both discovered the J/psi provided important and essential confirmatory evidence for such a major breakthrough.

Question: If both types of machines are required, but both machines can explore the same physics areas, why must the U.S. build both types (SLC is an electron accelerator, FERMI and SSC are proton accelerators) when the Europeans are also building both types (LEP is an electron accelerator and there are plans to install a proton accelerator in the LEP tunnel)?

Answer: The existing or planned world machines which you mentioned all have different capabilities for research and complement each other; in general, they explore different physics areas. With regard to the SLC and LEP electron-positron colliders, there is some overlap, but we must recall that SLC is justified as an accelerator technology study as well as a physics research facility and that both LEP and SLC have unique physics capabilities that do not overlap. SLC can operate with polarized beams, and because of its very small beam size, is ideal for searching for decays of short-lived objects. SLC will provide a critical technical test of the feasibility of future large linear colliders, while LEP employs conventional circular collider technology. While LEP can explore the same energy domain as SLC, it can also go to much higher energies than SLC and is expected to operate most of the time at energies of 60 GeV and above compared to the 50 GeV limit for SLC. Let me now turn to the proton colliders, Tevatron, SSC, and that talked of for the LEP tunnel at CERN. The Tevatron collider explores with 1 TeV per beam the 100-200 GeV mass range, by means of quark-quark and quark-gluon collisions. SSC with 20 TeV per beam would explore the TeV mass range which is clearly inaccessible to any other accelerator existing or planned. Thus, their energy domains are quite different. As for possible overlap with European facilities, I would note that Europe is still studying its future plans, including the possibility of a hadron collider in the LEP tunnel. The results of their study are expected in 1987, but there are no firm plans yet for other than completion of Phase II of LEP. This upgrade to follow immediately after Phase I, will raise the energy of LEP to 100-120 GeV per beam. If Europe decides to proceed with a hadron collider, their collider using today's superconducting magnet technology would have an energy of at most 5.5 to 6 TeV per beam and would suffer the limitations of having to share the tunnel with LEP, an important world class facility itself.

Utilization of Physics Facilities

Question: DOE has estimated that the utilization of its accelerator facilities is currently less than 50 percent. What factors have limited the utilization rates at the high-energy physics facilities?

Answer: Obviously the available funding is a prime factor which determines the total operating time of a facility during a given year. In some cases, there are also technical limitations on the various programs at each laboratory. For example, the Fermilab Tevatron can operate either for fixed-target experiments or for colliding beam experiments, but not both simultaneously. Thus, as we begin research in FY 1987 with the collider within an overall operating schedule slightly less than in FY 1985, the amount of operating for fixed-target research in FY 1987 will be substantially reduced from the FY 1985 level. In other cases, there are necessary long shutdowns for construction-related activities or major reorganization of experimental facilities. In FY 1986, SLAC was off the air for substantial time, and Fermilab almost totally, because of construction-related shutdowns, collider commissioning, and the Gramm-Rudman-Hollings reductions. There are also external situations such as the special summer power problems at SLAC where extremely large power rate premiums and vulnerability to unscheduled power outages make operation unfeasible and very expensive.

Question: What does DOE consider to be the optimal utilization rate for each of its physics accelerators? What is this rate based on?

Answer: We consider the practical maximum utilization of an accelerator facility to be the maximum number of weeks per year that the facility could be operated taking into consideration necessary downtime for maintenance, holiday periods, need to rearrange experimental configurations, the need to commission new beam lines, and special electric power stituations such as the summer power limitation at SLAC. We estimate that the practical maximum utilization would be 48 weeks out of 52 for Fermilab, 44 weeks for AGS, and 40 weeks for SLC. Optimal utilization, on the other hand, is defined to be the maximum cost-effective utilization of a facility, taking into account the overall cost-effectiveness, balance, and productivity of the total program at the laboratory. Optimal utilization is estimated to be 70-80 percent of the practical maximum depending upon the particular circumstances with the accelerator and experimental facilities in a given year.

Question: How do the utilization rates at DOE's physics facilities compare to utilization rates at foreign physics facilities?

Answer: The foreign facility most similar to Fermilab is the European Laboratory for Particle Physics, known as CERN, located near Geneva, Switzerland. During CY 1985, CERN operated its Super Proton Synchrotron, SPS, about 15 weeks for fixed target physics and another 21 weeks for the colliding beam research program. This totals 36 weeks of operation for physics research out of a 48 week practical maximum, or about 75 percent utilization. During FY 1985, Fermilab's Tevatron was operated for about 30 weeks for fixed-target physics, which is a utilization rate of about 62.5 percent.

The foreign laboratory most comparable to SLAC is the Deutsches Elektronen Synchrotron, DESY, in Hamburg, West Germany. DESY's PETRA collider is similar to SLAC's Positron-Electron Project, PEP, collider, and their DORIS II collider is comparable to SLAC's Stanford Positron Electron Asymmetric Ring, SPEAR, collider, although in both cases the DESY colliders are capable of operation at somewhat higher energies than are SLAC's. During CY 1984, DORIS II and PETRA achieved utilization levels of 53 percent and 77 percent, respectively. The corresponding fiqures at SLAC for FY 1985 were 43 percent for SPEAR operation for High Energy Physics, HEP, and 67 percent for PEP.

Question: What assurance can DOE provide that SSC, CEBAF and existing facilities will be optimally utilized if CEBAF and the SSC are approved for construction by the Congress?

Answer: We can, of course, give no firm assurance of optimum utilization of facilities which will depend on budgets as much as a decade from now. We constantly assess and prioritize program activities and do our best to assure that highest priority activities are carried out to the extent possible within the constraints of available funding and the essential need to maintain proper program balance. It is crucial to maintain a proper balance between short-term productivity and making adequate preparation to ensure the longer term viability of the program. Within the available funding it is necessary to carefully assess the various program elements to ensure proper emphasis for the best national program. Facility operations must be assessed within the broader context of all program needs. With regard to the specific question of operation of major new facilities such as SSC and CEBAF, the Department carefully examines the productivity and research potential of existing facilities as well as the need for new experimental capabilities continually.

Cost of Physics Facilities

Question: The current budget environment is making it increasingly difficult to fund new accelerator upgrades and facilities. DOE must ensure that federal funds are earmarked for accelerator upgrades or facilities that are likely to gain congressional approval. Is DOE required to approve advance research, conducted by a DOE accelerator facility, which is directed toward upgrading an existing facility or building a new facility? Is there a limit on funds spent for such research?

Answer: DOE gives its laboratories the freedom to pursue generic R&D studies within the scope of the Department's program guidance and specific funding allocations for high energy technology, without specific approval of each subactivity. Only when the R&D becomes focused on a specific project for which a line item construction proposal will result does the Department become involved with specific approvals. There are specific limitations on R&D associated with each project which are determined as part of the annual budget process and these begin when the R&D makes the transition from generic to project specific R&D.

Question: What is the status of research being conducted at SLAC related to a large linear collider? How much has SLAC spent on such research?

Answer: There is no R&D directed toward designing a large linear collider at SLAC or anywhere else. However, SLAC has spent about $1.5 million on generic R&D studies of advanced accelerator concepts. This generic R&D at SLAC, which might at some future date relate to such a machine, focuses on trying to understand what beam and performance parameters, and what technology, would be required for such a device. There is enough already known about these parameters to clearly indicate that the technology to build a large linear collider is not yet available. An early step in the long process of developing such technology will be the successful operation of the Stanford Linear Collider, SLC. However, many years of generic R&D on many seemingly unrelated technical questions still must be successfully completed before the design of a large linear collider can be undertaken. The state of this technology was recently reviewed in depth by the High Energy Physics Advisory Panel, HEPAP, and the results of this review are contained in the "Report of the HEPAP Subpanel on Advanced Accelerator R&D and the SSC," DOE/ER-0255, December 1985. One of the major conclusions of this study is that ". . . the earliest time at which an electron positron linear collider, if feasible, could overlap the range of physics interest of the SSC is 15-20 years."

Question: For any existing DOE accelerator facility, DOE utilizes the same contractor for physics research, operating a facility, and upgrading the facility. How does DOE assure that funds earmarked for research and operations are not used for accelerator upgrades?

Answer: DOE has a number of mechanisms to monitor contractor technical and cost performance. Technical performance is monitored primarily by the DOE headquarters' program division through review of monthly progress reports; formal laboratory-wide on-site annual reviews, including outside expert consultants; semi-annual project reviews; frequent on-site visits by DOE staff; ad-hoc reviews on special topics; and participation by DOE staff in laboratory advisory committee meetings. DOE has an on-site office at each of the major facilities to monitor activities on a day-to-day basis. Responsibility for fiscal and contract administration rests with the DOE field offices and their on-site area offices. The field office monitors fiscal performance through a variety of means including monthly cost reports submitted by the contractor, annual financial audits, approval authority on procurement actions above a specified limit (typically about $250,000), approval of subcontracts, annual performance appraisals, and detailed appraisals at the time of contract renewal.

Other Questions

Question: Briefly describe the process used to select the magnet design for SSC. Include who made the selection and what criteria was used.

Answer: The extensive magnet selection process was developed by the Central Design Group, CDG, in consultation with the scientific and technical community, and with the concurrence of DOE. Initially, a Technical Magnet Review Panel of experts was convened by the CDG to review the status of the magnet R&D program relative to each style of magnet studied. The CDG also set up three special task forces of experts to collect and evaluate specialized information related to the required magnet characteristics. These were the Aperture Task Force, Cost Comparison Task Force, and Operations and Commissioning Task Force. The Magnet Selection Advisory Panel, chaired by Professor Frank Sciulli of Columbia University, considered all five styles of magnets that had been studied. The advisory panel included three industrial consultants. The basic issues considered included relative capital cost of the overall project, workability of the design, complexity of the overall magnet system, operational complexity, costs and flexibility, impact on construction scheduling, further R&D requirements, and accelerator physics questions. The panel included in their considerations the reports and discussions of the task forces and Technical Magnet Review Panel and presentations and discussions of the design and R&D results by the scientists and engineers involved with each type of magnet. The recommendation of the panel and its consultants was unanimous. This recommendation was accepted by the Director of the CDG, Dr. M. Tigner, who made the final decision. This decision and the selection process were presented to and concurred in by the Department, and subsequently was the subject of a hearing by the House Science and Technology Committee on October 29, 1985. The chosen design has been incorporated into the Conceptual Design Report and is the focus of the present magnet R&D program.

Question: In the fusion energy program, provide the most recent program milestones, including scientific feasibility, breakeven, engineering feasibility, and commercial feasibility.

Answer: We expect to produce plasma conditions equivalent to breakeven conditions in the TFTR during the coming year, with actual tritium burning at breakeven occurring in 1989. The current program plan provides for an assessment of fusion's economic and environmental potential around the turn of the century. Our current program plan contains a more detailed identification and discussion of the interim milestones leading up to this assessment. This plan is supported by more detailed analysis being prepared by the technical planning activity managed by Argonne National Laboratory. I would like to provide a copy of our summary Magnetic Fusion Program Plan for the record.

(NOTE: The information referred to was placed in the subcommittee files.)

Question: What is the definition of a multi-program laboratory? How are these research facilities different from other DOE facilities?

Answer: The Department of Energy defines nine major laboratories as multiprogram laboratories. These are Argonne National Laboratory, Brookhaven National Laboratory, Lawrence Berkeley Laboratory, Lawrence Livermore National Laboratory, Oak Ridge National Laboratory, Pacific Northwest Laboratory, Los Alamos National Scientific Laboratory, Idaho National Engineering Laboratory, and Sandia National Laboratory. The designation "multiprogram laboratory" is based on the mixture of scientific and R&D activities at these laboratories which serve multiple DOE programs and on the large size of these institutions. Other large laboratories, such as Fermi National Accelerator Laboratory and Stanford Linear Accelerator Center, are devoted almost exclusively to activities related to a single program, in this case high energy physics, and thus are considered single purpose or dedicated laboratories rather than multiprogram laboratories. The designation as a multiprogram laboratory carries with it policy and procedural requirements such as adherance to the institutional planning process, which are specific to this category of research facility. To simplify the oversight process, a few smaller laboratories which serve more than one program are not classified by DOE as "multi-program laboratories" and, therefore, they are not required to follow the policies and procedures that are appropriate to the larger multi-program laboratories.

Question: Each of the DOE's multipurpose labs are recommended to receive a new research facility in this year's budget request. What is the rationale of limiting such requests to the institutions which are designated as multiprogram labs to the exclusion of other DOE labs that do conduct activities in a number of areas such as the Ames Laboratory?

Answer: The rationale for assigning certain new research facilities to specific multiprogram laboratories is based on DOE management's assessment of the capabilities, desires, interests, previous experience and balance among the various possible DOE sites. The Lawrence Berkeley Laboratory already had designed and DOE had requested FY 1984 funding from Congress for an LBL synchrotron facility in the energy range 1-2 GeV. The Oak Ridge National Laboratory has been pursuing the advanced reactor concept as a replacement for their successful, but 20 year old research reactor, High Flux Isotope Reactor. Argonne National Laboratory has been developing their concept of a 6 GeV facility since the Planning Study for Advanced Synchrotron Radiation Facilities first recommended such a facility in early 1984 and is a logical location for such an interactive facility. Since each of the new BES facilities requires considerable staff and effort to develop, considering the work loads at other laboratories, this decision is very appropriate. The DOE management decision process also considered the admonition from ERAB not to start another laboratory, the recommendations from several committees to begin the process of planning for new facilities as soon as possible, the need to plan for possible use of these facilities for defense purposes including classified research and the recommendation from the Packard Committee on Federal Laboratories. The smaller laboratories such as Ames Laboratory will be assigned suitable projects, but these three have been given to the appropriate laboratories with the above rationale.

Question: Has the development of the Center for Advanced Materials at Lawrence Berkeley Lab caused any reductions in the program support for other on-going research programs in materials research?

Answer: The development of the Center for Advanced Materials (CAM) at Lawrence Berkeley Laboratory has not caused reductions in the program support for other on-going research programs in materials research. The CAM program is proceeding with a steady buildup with funds specifically earmarked for it. Construction of the two CAM buildings is on schedule with the first building, the Surface Science and Catalysis Laboratory to be ready for occupancy about May 1987. The CAM research program will continue to grow at a modest rate until the buildings are fully occupied. No reductions of other programs to fund CAM are contemplated, although priorities within the materials sciences do shift with new opportunities and emphasizing new priorities will cause changes in program direction.

Question: Do you have an institutional plan for the development of the labs under your direction? Does this plan include recognition of the role of these labs as engines for economic growth in particular regions?

Answer: The plans for the development of laboratories under my direction are contained in the annual results of the institutional planning process. Senior laboratory management and senior Departmental officials participate in the process of establishing the future plan for each laboratory in the system. Laboratory management proposes appropriate missions and long range development goals for each laboratory. Departmental management shapes these missions and plans through policy, general guidance on the relative role of the laboratories, and individual annual planning guidance to each laboratory's management. Although the laboratories have historically had responsibility for providing new technology to the private sector, the advent of the Stevenson-Wydler Act has increased the emphasis on effecting these transfers. The laboratories have established specific offices within their organization to accelerate the transfer of new technology to industry. Most laboratories have established a method of promoting the regional possibilities for use of the new technologies. These methods vary depending upon the nature of the laboratory and the development environment of its region. The regional approaches are still too new to permit a concrete assessment of their eventual effectiveness.

Magnetic Fusion

Question: Given the President's endorsement of magnetic fusion at the Geneva Summit, why did the Administration propose cutting the budget for FY 1987?

Answer: The cuts that you refer to in the FY 1987 budget were necessitated by our concern over growing budget deficits. However, the reductions in fusion were made in carefully selected areas, such as research on the tandem mirror concept, so that our ability to cooperate with the Soviets would not be jeopardized.

Question: How much money has been spent on the large Mirror Fusion Test Facility/B (MFTF/B) to date?

Answer: A total of about $354 million has been spent on MFTF-B. This includes construction costs of $241 million plus $113 million for design, research, and development support and fabrication of auxiliary components.

Question: With such a large investment already made in MFTF/B, why has the budget proposed to mothball it?

Answer: As you know, the Gramm-Rudman-Hollings Law established austere budget goals for Government expenditures. The Department of Energy had to accommodate these budget pressures. This has resulted in a reduced Magnetic Fusion Energy program budget. In order to accommodate these reductions, difficult decisions on what could be afforded had to be made. We decided to maintain the scientific strength of the program needed for international collaboration on the tokamak, while also maintaining an advanced toroidal program to build and improve upon the tokamak concept.

Question: Is there international interest or other Federal agency interest in the MFTF-B?

Answer: We have held preliminary, informal discussions with the Japanese on MFTF-B collaboration. They have shown some interest, but like us, have to first balance their program priorities and then identify funds. No funds are seen as immediately available from these discussions. As far as interest from other Federal agencies, none have been expressed to us.

Question: Is it realistic to suppose that international support for MFTF/B will be forthcoming if the United States drops mirror fusion research altogether?

Answer: It is difficult to determine whether there will be international support until we have further explored this subject with foreign interests.

Question: How much funding would be required in FY 1987 to continue the MFTF/B program at some meaningful level?

Answer: In order to operate MFTF-B as a tandem mirror, a year of further preparation is required during which the neutral beams would be installed, the ECH system added, and plasma diagnostics fabricated and installed. This preparation for operations would require at least $50 million instead of the $15 million for mothballing activities. If this scenario were to be pursued and experiments on MFTF-B were to be initiated, actual operating costs for MFTF-B and supporting programs would be about $70 million per year.

QUESTIONS SUBMITTED BY SENATOR DOMENICI

Energy Storage

Question. You seem to be enthusiastic about the fuel cells program on transportation, even though the Administration's budget request has reduced drastically on all fuel cells programs. Personally, I am concerned that when Congress added funds to fuel cells programs, your department seems to be able to play with words and not passing funds through to fuel cells programs in the past. Would you please explain to me your justification?

Answer. It is true that the application of fuel cells to transportation vehicles looks very promising. Our generic research on Solid Polymer Electrolyte fuel cells is progressing very well, and this fuel cell type seems to be the best candidate in the long term to serve the vehicular needs most efficiently. There does not appear to be a substantial near-term market for fuel-cell-powered vehicles. The Budget Request includes funds to continue this research and reflects our judgment to maintain continuity and technical progress in areas of highest priority and potential payoff. In FY 1986 and FY 1987, DOE will focus on the most promising option, solid polymer electrolyte technology. This technology has high energy density, lower temperature operating characteristics, and the potential for ease in fabrication. In addition, more fundamental work on electrocatalysis will be carried out to provide the technology base for advanced fuel cell technology.

Question: The budget request for Magnetic Fusion program is down 9% from $365 million to $333 million. Will $333 million be able to maintain our effort in key technical areas for an effective program, particularly the Advance Fusion Concept programs?

Answer: The $333 million budget request will allow us to sustain an effective and balanced program to address the four remaining key technical issues in fusion. To maintain progress at this level, it has been necessary to focus the program on development of the toroidal concept and to eliminate research on tandem mirrors. Consistent with this approach, funding for Advanced Fusion Concepts has been maintained constant. This support includes funds for the continuation of fabrication efforts on two new experimental projects: a reversed field pinch device at LANL and a field reversed configuration device at Spectra Technology, Inc.

Superconducting Super Collider

Question: We have had several discussions on SSC, particularly on the international participations. Would you elaborate on your observation regarding SSC status and the possibility of international participation?

Answer: R&D on the SSC has gone well and the Conceptual Design Report, due in April, is expected to contain a feasible, detailed, and well-costed design. The Department, using this input will conduct a thorough review this spring of the entire scientific, technical, and cost aspects of the SSC. This review will serve as important input to the Department's decision this summer on whether to seek authorization to initiate construction of the project in FY 1988 or in some future year. The interest in the SSC is worldwide. Because it will be world-leading for decades to come, it will attract international participation. The Japanese, in particular, have indicated interest in participation in the facility and collaboration in the experimentation if the U.S. proceeds. The Western Europeans are presently preoccupied with construction of two world-forefront billion-dollar class facilities of their own and may not be able to contribute substantially. The Italian physicists have exhibited interest in involvement with SSC, as have Canadian physicists. In any case, wide-spread international collaboration and cost sharing on the detectors are firmly anticipated. A commitment on the part of the U.S. to go forward with the SSC would encourage international support for the project and I believe lead to specific collaborations.

Question: Many States are gearing up to bid for the honor of being the host State for SSC. Many states prepare to offer incentives to DOE for siting SSC. What is your feeling concerning the siting criteria?

Answer: I believe that the technical advisory on site parameters by the SSC Central Design Group (CDG) provides a sound basis for a set of technical site criteria. With regard to the issue of state bidding and incentives which clearly impact on the cost of the SSC to the Federal government, we have been anticipating that the states would offer at least the site free of charge, as was done in the 1960's for what is now Fermilab. Assistance on utilities, roads, and other site improvements would also be appropriate. We welcome the opportunity to reduce the cost of the project to the federal government and believe that it is appopriate that the states offer inducements to attract high-technology facilities, whether government or private, that might help build the local economy. On the other hand, this facility is of crucial importance to the future of basic research in this country, and full consideration must be given to all the site criteria important to its success as a world-forefront facility.

SUBCOMMITTEE RECESS

Chairman Hatfield. The committee will be in recess.

[Whereupon, at 3:06 p.m. Tuesday, March 11, the subcommittee was recessed to reconvene at 2 p.m. Thursday, March 13.]

ENERGY AND WATER DEVELOPMENT APPROPRIATIONS FOR FISCAL YEAR 1987

THURSDAY, MARCH 13, 1986

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 2:10 p.m. in room SD–192, Dirksen Senate Office Building, Hon. Mark O. Hatfield (chairman) presiding.

Present: Senators Hatfield, Kasten, and Domenici.

DEPARTMENT OF ENERGY

NUCLEAR FISSION R&D, URANIUM ENRICHMENT, AND NUCLEAR WASTE DISPOSAL PROGRAMS

STATEMENTS OF:

JAMES W. VAUGHAN, JR., ACTING ASSISTANT SECRETARY FOR NUCLEAR ENERGY

BEN C. RUSCHE, DIRECTOR, OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT, DEPARTMENT OF ENERGY

ACCOMPANIED BY:

JOHN R. LONGENECKER, DEPUTY ASSISTANT SECRETARY FOR URANIUM ENRICHMENT

DR. LYLE C. WILCOX, DEPUTY ASSISTANT SECRETARY FOR REACTOR SYSTEMS, DEVELOPMENT AND TECHNOLOGY

WILLIAM R. VOIGHT, JR., DIRECTOR, OFFICE OF REMEDIAL ACTION AND WASTE TECHNOLOGY

OPENING REMARKS

Chairman HATFIELD. The hearing will please come to order.

This afternoon, we continue our hearings on fiscal year 1987 budget proposals from the Department of Energy, and today we will receive testimony on nuclear fission, uranium enrichment and nuclear waste disposal programs.

We welcome our two principal witnesses, Mr. James W. Vaughan, Acting Assistant Secretary for Nuclear Energy; and Mr. B.C. Rusche, Director of the Office of Civilian Radioactive Waste Management.

Mr. Vaughan, your full statement will be included in the record, so if you wish to proceed to highlight or to outline it, we would be very happy to have your testimony.

SUMMARY OF NUCLEAR ENERGY BUDGET

Mr. VAUGHAN. Mr. Chairman, I am pleased to have this opportunity to summarize the Department's nuclear energy supply research and development programs and our uranium enrichment programs.

The Department places high priority on ensuring that nuclear energy continues to contribute to a strong, stable, and secure national energy base to meet both civilian and military requirements. Our reactor development programs to help preserve the nuclear option and our execution of a reliable, competitive, and businesslike uranium enrichment enterprise are an integral part of that commitment.

The funding levels for our various program elements are tabulated in my prepared statement and I will not repeat them. While the overall fiscal year 1987 budget request for our nuclear energy supply research and development programs increases slightly from our fiscal year 1986 estimate, there have been some shifts in relative funding levels for individual programs. Within an essentially level budget, our funding request for nuclear energy R&D has decreased by about $45 million, while funding for remedial action and waste technology has increased by some $64 million compared to last year.

BUDGET FORMULATION CRITERIA

There are several key factors that influenced the formulation of our programs and our budget request.

First, the Department is fully committed to support the bipartisan effort to control and reduce the Federal deficit. In this necessary environment of fiscal constraint, we are constantly faced with difficult choices among deserving programs. Therefore, although it may appear to some that worthwhile R&D elements have been eliminated or significantly reduced, we believe that each of our programs is focused to make optimum use of limited resources.

Second, space and defense nuclear energy needs are increasing as previously planned. All of these activities are an essential part of a top national priority.

Third, our Civilian Reactor Research and Development Program is more sharply focused. Last year, we testified to our conviction that the institutional and technical impediments to the near-term deployment of light water reactors must be overcome before there would be a good chance to realize the potential of advanced reactors. Our Light Water Reactor R&D Program is focused on essential safety and reliability research and development which can help facilitate efforts by U.S. industry to usher in a new, advanced generation of nuclear powerplants.

Certainly, the anticipated timing for the commercial introduction of innovative reactor technologies, beyond light water reactors, has been stretched out. We have made good progress in our high temperature gas-cooled and liquid metal reactor design work in the past 2 to 3 years. Our focus will now be upon key features affecting the economic, passive safety, and technical issues of these concepts to preserve their potential for the future.

Fourth, although the remedial actions and waste technology budget request does increase significantly compared to last year, the increase is less than previously forecasted. The program objectives can be achieved at the requested funding level by extending the authorization period for the Department's Uranium Mill Tailings Remedial Action Program from March 1990 until the end of fiscal year 1993.

URANIUM ENRICHMENT

Finally, the uranium enrichment budget request reflects several strategic decisions made by the Department during the past year, including placing the Oak Ridge gaseous diffusion plant into a standby condition, termination of the gas centrifuge enrichment plant project, and selection of the atomic vapor isotope separation process as the advanced uranium enrichment technology for the United States for the next century.

Against this background, let me turn to a few of the key issues and highlights of our nuclear energy R&D programs.

NUCLEAR ENERGY RESEARCH AND DEVELOPMENT

The Department has provided R&D support for both the defense and civilian nuclear energy areas for decades. Both will continue to be served by our proposed program, which is integrated and coordinated so as to minimize overall cost. The priority for the defense nuclear energy programs for military applications has not changed; those programs related to SDI have expanded and moved ahead as previously planned, while overall funding stringencies have tightened.

Therefore, in the face of the urgent need to reduce Government outlays, we have adjusted the pace of our Civilian Reactor Development Program, one which will still keep us ahead of market needs for the types of reactors involved. The agenda in our draft strategic plan for civilian reactor development, which is currently being reviewed by the Energy Research Advisory Board, remains valid. We plan to make adjustments in the scope and pace of those tasks to reflect national priorities, funding constraints and comments received from the review panel and others.

LIGHT WATER REACTOR RESEARCH

Turning for a moment to our light water reactor effort, the technical support for demonstrated removal of the remaining technical, licensing, and institutional impediments to the next generation of these plants as well as for innovative advanced reactors, remain a key objective of our R&D programs.

Work on advanced light water reactors includes R&D needed to bring forward a new generation of midsized reactors. With today's pattern of lower load growth rates, plants with smaller than 1,000 megawatt electric ratings and lower total capital cost may be required to meet utility needs. Both the market and the regulatory processes are too uncertain to justify the sufficient private sector financial investment on their own to carry the design concepts to a State at which their potential can be adequately assessed. In fiscal years 1986 and 1987, DOE, through competitive contracting and in cooperation with EPRI, will be providing selected technology support for these advanced designs through cost-shared programs.

In response to a request that your subcommittee made last year, Mr. Chairman, we have provided, just prior to this hearing, a detailed report on these activities.

ADVANCED REACTOR CONCEPTS

With respect to our more advanced civilian reactor research and development in the current fiscal year, work will continue on the development of liquid metal reactor and high temperature gas-cooled designs and their supporting R&D activities. Fiscal year 1987 will see a further focusing of our effort on key economic and safety aspects of these designs to ensure assessment of the technical points effecting licensing.

These programs for 1987 and beyond will build on the significant progress made in the past few years. Passive safety features are being incorporated into these advanced reactor designs to reduce significantly the likelihood and consequences of plant failures. The potential exists to accomplish a number of things in terms of the response of these plants to severe accidents, to achieve much longer core life programs, to achieve and use state-of-the-art technology in communication, controls, and operations. In addition, we are continuing our advanced metal fuels work to establish the technical feasibility to improve safety margins, fuel cycle costs, and on-site reprocessing.

SPACE AND DEFENSE POWER SYSTEMS

As I think most of you know, the space and defense power systems segment of our program is structured to respond to requirements identified by NASA and the Department of Defense, including the SDI organization. These are all cost-shared programs, which will provide the design, development, and supporting technology to build compact, high-performance reactors for space and terrestrial applications and dynamic isotope power systems for space application.

Our SP-100 Space Reactor Program is moving into the 5-year ground engineering test phase based on a reference mission that has been established by SDI. The Multimegawatt Space Nuclear Power Program concentrates on the evaluation of potential higher space power concepts and the development and testing of enabling technology leading to the selection of a reference concept by 1991.

The small nuclear power source demonstration project will demonstrate in fiscal 1987, performance of a reactor subsystem that will be an alternative to conventional power systems for applications such as the North Warning System, which is an upgrade of the DEW line across northern Canada. Last, our Multimegawatt Terrestrial Nuclear Power Program will design a passively safe, 10-megawatt electric hardened nuclear powerplant to meet needs which have been identified by the Air Force, as well as SDI. The request for proposals for this latter project will be issued in the next few weeks.

In our Advanced Nuclear Systems Program, we will continue our responsibilities to develop, demonstrate, and deliver radioisotope power sources for both military and civilian space and terrestrial missions. The RTG's, as they are called, for Galileo and Ulysses passed all their tests and are ready for launch. As you know, the launch has been deferred to the summer of 1987. Additionally, NASA is planning to continue to use these on their future missions and we are continuing to work with DOD and NASA to pursue the technology of advanced RTG's that offer promise of higher power density and greater size adaptability as mission requirements evolve.

With respect to the continued operation of our liquid metals reactor test facilities, I would simply note that the operation of these facilities continue to make significant contributions to the United States and international liquid metals operating experience as well as providing testing capabilities required for the development of nuclear energy sources that will be needed for space and military application.

Some of the achievements in the past year from the tests in these facilities, which are important programmatic activities, are tabulated in my written statement. The Department is also evaluating whether alternate cost-sharing methods among other DOE programs should be applied to these facilities' costs.

REMEDIAL ACTION

Let me turn, now to our remedial action and waste technology programs. My written statement contains detailed information on each of the projects underway in this program. Emphasis in all of the remedial action programs will concentrate on cleanup activities at highest priority sites and the continued protection of the public and the environment at all sites.

Of particular interest to this subcommittee is the uranium mill tailings remedial action project, which is responsible for conducting remedial action at 24 former uranium ore processing sites and several thousand contaminated vicinity properties. Our proposed 3½-year extension of this project takes into consideration the actual project experience gained in performing remedial action at several processing sites and many vicinity properties. Project plans have been revised to reflect this experience and more level funding and workloading among the projects. Within these plans, work will continue first at the high priority sites with minimal planned extension in previous schedules for these sites.

I note, Senator Hatfield, that you are interested in the Lakeview, OR, project, and work is planned to be underway there in fiscal year 1986 as previously planned, and I know Senator Domenici, you are interested in the Shiprock project, which you and I had the opportunity to dedicate. That work is proceeding well and on schedule.

Let me conclude with a summary of our uranium enrichment activities.

Our fiscal year 1987 budget request for this program is approximately $1.05 billion in budget authority, which will be fully offset by $1.29 billion in projected revenues. In addition, the Department proposes to return $235 million to the Treasury as a part of the repayment of prior Government investment in the uranium enrichment enterprise.

Our primary objective is to retain a competitive, financially healthy uranium enrichment supply capability in the United States for the long term.

Important progress has been made in achieving the seven major goals established for this uranium enrichment enterprise, as articulated in the June 1985 strategy document and as outlined in my written statement.

ADVANCED ENRICHMENT TECHNOLOGY

We, in the past few years, have become more cost competitive, improved the operation of the existing gaseous diffusion plants, and are continuing the development of AVLIS which we believe is the world's most advanced enrichment technology for the future. Of most significance, in this program, through several creative marketing initiatives, we have been able to increase our share of the free world enrichment market from 46 percent in 1985 to 53 percent in 1990.

Within the United States, the corresponding numbers get us to more than 80 percent of the domestic market in that same timeframe.

There is, however, much more to be done, and the next 2 years will be very critical for the enrichment enterprise.

One key action recently initiated by DOE is the proposed modification of the uranium enrichment services criteria. We noticed a proposed rulemaking in the Federal Register at the end of January 1986. The proposed criteria modification addresses: First, the items that were questioned in the miners' lawsuit; other aspects of the enterprise, including flexibility for future competitive actions; and last, a reiteration of the Department's position opposing restrictions on the enrichment of foreign natural uranium. We hope to complete this rulemaking process by the end of summer.

A new initiative which is now under review is an effort to transfer future development and ultimate deployment of the AVLIS technology to the private sector. This is part of a general evaluation of areas in which the private sector can beneficially be involved in the enterprise. As a minimum, we hope that the private sector will be interested in deploying the AVLIS technology. I would emphasize that this is an area in which we have initiated an evaluation and are going to form late careful plans before we proceed in any manner which would be detrimental to the enterprise.

INTRODUCTION OF ASSOCIATES

This completes my statement, Mr. Chairman. I have several of my colleagues with me—Mr. Longenecker, Dr. Wilcox, and Mr. Voight. We would be pleased to respond to your questions at this time.

Chairman Hatfield. Thank you very much, Mr. Vaughan.

I am glad you picked up where I failed to introduce your colleagues who did accompany you. The record should show we have with us Mr. William R. Voight, Jr., who is the Director of the Office of Remedial Action and Waste Technology; Dr. Lyle C. Wilcox, who is our Deputy Assistant Secretary for Reactor Systems, Development and Technology; and Mr. John R. Longenecker, who is the Deputy Assistant Secretary for Uranium Enrichment.

At this time, I will invite Mr. Rusche to make his presentation. Then we will begin questioning for all of you. Your full statement will be placed in the record, and if you wish to highlight it, we would be very happy to hear it.

CIVILIAN RADIOACTIVE WASTE MANAGEMENT PROGRAM

Mr. RUSCHE. Thank you, Mr. Chairman.

I am pleased to appear before you today to present the fiscal year 1987 budget for DOE's Office of Civilian Radioactive Waste Management. I might take just a few moments to highlight our request. Our budget request is under two funding areas.

First, the Nuclear Waste Fund, which is funded by fees collected from owners and generators of spent nuclear fuel and high-level radioactive waste; and second, the Civilian Radioactive Waste Research and Development Program funded from the general fund.

Since the Nuclear Waste Policy Act of 1982 requires the submission of a triennial budget under the fund, our detailed budget request and formal statement provide estimates for both fiscal years 1968–89. But I do not plan to dwell on those except in answer to your questions.

Our request for fiscal year 1987 under the waste fund is $769.3 million, compared to $499 million in fiscal year 1986. This is representative of the administration's commitment to fully implementing the Nuclear Waste Policy Act essential for commercial and defense nuclear activities, but even more importantly, for all Americans.

Our request under the civilian R&D program is $6.5 million, compared to $16 million in fiscal year 1986. This funding level is consistent with our assessment of the best application of limited funds for generic research.

NUCLEAR WASTE FUND ACTIVITIES

If I may turn quickly to the waste fund activities, the request under the fund summarized in table 1 of my formal statement is complete, but let me highlight it.

The 1987 request for first repository activities is $541.8 million, compared to the 1986 appropriation of $386 million. This increase will provide for extensive site characterization activities to begin exploratory shaft design and construction and to conduct intensive engineering tests and analyses to support the waste package and repository designs for the first repository.

We expect to issue final environmental assessments, nominate, and then recommend to the President, hopefully, around the end of April, three sites for characterization for the first repository.

As part of this process, we are planning to meet with the National Academy of Sciences the end of March to discuss their conclusions with regard to our application of a ranking methodology in arriving at the recommendation of three sites for characterization.

The milestones are shown in my detailed statement.

The act directs DOE to conduct site investigations for a second repository, although construction of a second repository is contingent upon future congressional authorization; that is, we are not now authorized to proceed with the second repository.

The 1987 request in the budget under the title, "Second Repository," is $78.7 million, compared to the fiscal year 1986 appropriation of $35.5 million.

That category is somewhat a misnomer, since for the second repository, we may consider for such sites those: identified as potentially acceptable but not nominated for the first repository; those characterized but not chosen for the first repository and; sites found potentially acceptable from rock formations not previously studied in the first repository selection process. In this case, these are all crystalline rock bodies.

It is this last category for which $78.7 million is requested, and it is principally to fund preparation for on-site area-phase work which is scheduled to begin in fiscal year 1988. We are currently in the midst of conducting more than 70 public briefings and hearings in North Central, Northeastern, and Southeastern States to receive comments on a draft area recommendation report which proposes 12 potentially acceptable sites for which we would like to begin preliminary field work. Those proposed areas are: one in Georgia, two in Maine, three in Minnesota, one in New Hampshire, two in North Carolina, two in Virginia, one in Wisconsin.

MONITORED RETRIEVABLE STORAGE

Briefly, on monitored retrievable storage [MRS], I am rather limited in what I can say about the MRS in a formal sense because of the injunction by the district court in Tennessee, but I believe I can bring you up to date very briefly.

As required by section 141 of the act, we have completed the proposal prepared for Congress on the need for and feasibility of MRS; and we believe MRS is and ought to be an integral component of a waste disposal system.

The fiscal year 1987 budget includes $46 million compared to $3 million appropriated in fiscal year 1986 and, should we receive congressional authorization and appropriation to proceed, would be used primarily for site data collection and analysis, final design, regulatory compliance studies, and State liaison activities.

Finally, we are abiding by the February 7 court injunction and, therefore, have not submitted the formal proposal to Congress. However, our appropriation request is based on earlier review documents in anticipation of the formal proposal we had hoped to submit to Congress on February 10 and which were provided before the injunction. DOE has appealed the lower court's order and injunction and has been granted an expedited schedule by the court of appeals. We hope to have a resolution of the legal issues by summer.

I want to be sure that I don't leave any misimpression as to what I have said and done is to make a formal proposal that would be contrary to the injunction by the Department. However, our budget request is entirely appropriate, I believe.

For transportation and systems integration we are requesting $33.4 million compared to $21.3 million in fiscal year 1986. The major activities for fiscal year 1987, including funding for the private sector to design, fabricate, and test prototype casks for transport from reactor to either an MRS or directly to a repository.

With respect to staffing, the 1987 request will provide for a sustained staffing level to this year and next year of about 292 full-time equivalent positions at project offices and headquarters to fund management, site investigation, technology development, and institutional liaison.

WASTE FUND RECEIPTS

The activities which I have just proposed for fiscal year 1987 funding are requested for funding under the Nuclear Waste Fund into which the owners and generators have been paying now for 3 years. Projected receipts into the fund are summarized on page 19 of my prepared statement.

In 1986, we received $498 million. We project $538 million in fiscal year 1987; $597 million in fiscal year 1988; and $625 million in fiscal year 1989. These funds are adequate to cover the costs that we project. Finally, for the R&D program, the DOE's Civilian Radioactive Waste R&D Program efforts are to encourage and expedite the availability of licensed new at-reactor storage technologies.

Under the R&D program and from the general fund, we are requesting only $6.5 million compared to $16 million in fiscal year 1986.

We are requesting no funds for R&D concerning alternative means of disposal described in section 222 of the act, but instead are concentrating on cooperative agreements with utilities to demonstrate, for example, rod consolidation, and dry storage technologies.

For program direction, we are requesting only $200,000. We are requesting three full-time equivalent positions as compared to five in fiscal year 1986.

Mr. Chairman, this concludes my overview. I would be happy to address any of your questions as you suggest.

Chairman HATFIELD. Thank you, Mr. Rusche.

[The statement follows:]

STATEMENT OF JAMES W. VAUGHAN, JR.

Mr. Chairman and Members of the Subcommittee, I am pleased to have the opportunity to discuss the Department of Energy's FY 1987 budget request for Nuclear Energy Supply Research and Development and Uranium Enrichment programs. The requested funds are distributed among the program elements as summarized in the following table:

	--($ in Millions)--	
Program Element	FY 1986 Estimate	FY 1987 Request
Nuclear Energy Supply R&D		
Nuclear Energy R&D	$ 375.7	$ 330.9
Remedial Actions and Waste Technology	$ 230.0	$ 294.1
Policy and Management	$ 1.7	$ 1.8
TOTAL	$ 607.4	$ 626.8
Uranium Supply & Enrichment Activities		
Uranium Enrichment Activities	1,550.4	1,051.4
Payback to Treasury	0*	235.0
Uranium Enrichment Revenues	1,360.6	1,286.4
Net Uranium Enrichment	$ 189.8	$ 0

* Revenues in excess of outlays of approximately $110 million will accrue to the Treasury in FY 1986.

A more detailed funding table is included in the discussion of each major program. The FY 1986 figures in these tables reflect appropriated totals reduced by sequestrations responsive to Public Law 99-177 (the Gramm-Rudman-Hollings Deficit Reduction Act), management initiatives, and other general reductions. The FY 1987 Uranium Enrichment request reflects both planned partial payback of prior Government investment and offsetting revenues, resulting in a net zero appropriation for that activity.

OVERVIEW

We place high priority on ensuring that nuclear energy continues to contribute to a strong, stable, and secure national energy base to meet both civilian and military requirements. Nuclear energy, along with fossil and renewable energy sources, are essential elements to achieving that goal at reasonable cost. The Department's commitment to nuclear energy remains strong. Our reactor development programs to help preserve the nuclear power option and our execution of a reliable, competitive, and businesslike uranium enrichment enterprise are an integral part of our commitment. The Department also remains strongly committed to protecting public health and safety and to assuring a safe and clean environment in connection with its activities. Our remedial action and waste technology efforts are an integral part of that commitment.

In assessing our FY 1987 nuclear energy program priorities, we have faced hard choices for many of our program elements in a time of fiscal constraint. While the FY 1987 budget request for Nuclear Energy Supply Research and Development programs increases slightly from our FY 1986 estimate, there have been several shifts in relative funding levels for individual programs. Within that essentially level budget, our funding request for nuclear energy research and development (R&D) has decreased by about $46 million, while funding for Remedial Actions and Waste Technology has increased by some $64 million compared to FY 1986.

Key factors that influenced the formulation of our programs and budget request include:

First, the Department is fully committed to support the bipartisan effort to control and reduce the Federal deficit. In this necessary environment of fiscal constraint, we are constantly faced with difficult choices among deserving programs. Although it may appear to some that worthwhile R&D elements have been eliminated or significantly reduced, we believe that each of our programs is sharply focused to make optimum use of limited resources.

Second, space and defense nuclear energy needs are increasing, particularly those associated with the Strategic Defense Initiative (SDI). Some of our activities in this area have progressed from the design and screening phase into the more funding-intensive hardware phase. These activities are an essential part of a top national priority. Accordingly, our funding request for these efforts in our nuclear energy R&D programs has increased in FY 1987 as previously planned. Certain benefits derived from the nuclear energy R&D work to support these national security requirements will be applied to future civilian reactor development efforts and complementary base technology activities will continue.

Third, our civilian reactor research and development program has been reduced, but more sharply focused on assuring that a path exists to maintain nuclear power as a robust option for the rest of this century and beyond. Last year, we testified that the institutional and technical impediments to the near-term deployment of light water reactors must be overcome before there would be any chance to realize the potential of advanced reactors. This is reflected in the priorities within the funds available for reactor research and development. Our Light Water Reactor (LWR) R&D program is more sharply focused on research and development which can help facilitate efforts by U.S. industry to usher in a new, advanced generation of nuclear powerplants. The Department's LWR R&D programs will continue to emphasize advanced in safety technology including continued evaluation of the Three Mile Island accident. It is our view that the time is ripe for the completion of development and certification of advanced, state-of-the-art LWR designs. Certainly the currently anticipated timing for the commercial introduction of innovative reactor technologies beyond light water reactors has been stretched out. We have made excellent progress in the past 2 to 3 years on design work for High Temperature Gas Reactors (HTGRs) and Liquid Metal Reactors (LMRs); our focus is now upon key features affecting the economic, passive safety, and technical issues of these concepts. Our funding request for civilian advanced reactor development activities has been reduced in FY 1987 consistent with this extended timing and other nearer-term priorities including space and defense activities.

Fourth, the Remedial Actions and Waste Technology budget request increases by $64.1 million compared to the FY 1986 estimate. The program objectives can be achieved at this level of funding by extending the authorization period for the Department's Uranium Mill Tailings Remedial Action (UMTRA) Program from March 1990 until the end of FY 1993, consistent with the guidance provided in House Report No. 99-195 accompanying the FY 1986 Energy and Water Development Appropriations Act (Public Law 99-141). We will formally request such an extension later this year. Emphasis in all remedial action programs will concentrate on cleanup activities at the highest priority sites and the continued protection of the public and the environment at all sites.

Finally, the Uranium Enrichment budget request reflects several strategic decisions made by the Department during the past year. Chief among these are placing of the Oak Ridge (Tennessee) Gaseous Diffusion Plant in standby, termination of the Gas Centrifuge Enrichment Plant (GCEP) project, and selection of the Atomic Vapor Laser Isotope Separation (AVLIS) process as the advanced uranium enrichment technology for the U.S. in the 21st Century. During FY 1986, the Department will initiate an effort to transfer development and ultimate deployment of the AVLIS technology to the private sector. The FY 1987 budget request reflects these decisions.

More detailed discussion of these factors and the scope, status, and budget request for our programs is contained in the sections that follow.

NUCLEAR ENERGY RESEARCH AND DEVELOPMENT

The funding request for Nuclear Energy Research and Development is contained in the following table:

Program Element	----($ in Millions)---- FY 1986 Estimate	FY 1987 Request
Nuclear Energy R&D		
Light Water Reactors	$ 48.1	$ 41.0
Advanced Reactor R&D	128.5	49.5
Space/Defense Power Systems	20.2	71.7
Advanced Nuclear Systems	19.5	23.6
Facilities	132.2	121.8
Water Cooled Breeder	19.0	13.8
Program Direction	8.2	9.5
Total	$ 375.7	$ 330.9

The Department has provided R&D support for both the defense and civilian nuclear energy areas for decades and both areas will continue to be served by these proposed programs. It is our intent to integrate and coordinate those efforts to the maximum extent practical so as to minimize the overall cost. The priority of defense nuclear energy programs for military applications has not changed; programs have expanded and moved ahead as planned while the overall funding stringencies have tightened. Two factors are at work. One is the decrease in orders by utilities for new nuclear generating capacity resulting in a relaxation, which may be temporary, of the urgency for advanced reactor technology for civilian applications. The second is the emergence of the Strategic Defense Initiative and its multiple concepts for which advanced nuclear power technology is frequently the most advantageous choice to meet power source needs. In the face of the urgent need to reduce Government outlays, the Department has recommended an adjustment in the pace of the civilian reactor development program and use of existing capability to meet growing space and defense needs rather than initiate the buildup of a new, separate, and costly program capability unique to space and defense applications. Our programs in support of military and civilian energy needs are complementary. Certain benefits that accrue from each program will be applied to other programs. The principal areas of interface are in application of common technology, facility utilization, and shared use of available expertise in our laboratories and contractors.

Our advanced reactor R&D program builds upon significant past success to focus upon key features related to safety and economics of advanced reactor systems. Application of improved state-of-the-art LWRs represents the most likely path to revitalizing the nuclear power option. Emphasis in our LWR program is on supporting a process leading to enhanced safety; improved, more predictable licensing; and certification of advanced LWR designs.

Supporting all of these R&D efforts will be the continued operation of the unique test facilities and analytical laboratories required for developing and verifying advancements in reactor systems, fuel, components and power conversion systems.

The FY 1987 nuclear energy R&D program consists of the following elements: Light Water Reactors, Advanced Reactor R&D, Space and Defense Power Systems, Advanced Nuclear Systems, Facilities, and Water Cooled Breeder.

A discussion of each of the program elements that comprise the FY 1987 Nuclear Energy R&D budget request follows.

LIGHT WATER REACTORS

From the experience accumulated to date on LWR research, design, construction, operation, and regulation, it is evident that major national benefits can be realized by near-term advancements in each of these areas. Consistent with industry responsibilities, programs are already underway by the reactor manufacturers and the electric utility industry to exploit these opportunities for existing LWR's and, to some extent, for LWR's yet to be committed. The Department's LWR program in FY 1987 will provide additional technical confidence that the benefits of evolutionary improvements to existing LWR's are realized, and will explore the impact and benefits that can be expected from the application of additional R&D efforts to bring more standardized, advanced, state-of-the-art LWR's to fruition in this country within an improved licensing and regulatory system.

The technical support for demonstrated removal of the remaining technical, licensing, and institutional impediments to the construction and operation of next generation LWR's, as well as innovative advanced reactors, is a key objective of our R&D programs. A key milestone in the pursuit of this objective will be to achieve Nuclear Regulatory Commission (NRC) certification of at least two Advanced Light Water Reactor (ALWR) systems in approximately 5 years. The pursuit of this objective will have the effect of focusing and guiding the Department's efforts in the LWR program area. The major areas of work in the LWR program element are LWR Safety and Licensing, Advanced LWR Technology, and Three Mile Island (TMI) R&D.

LWR SAFETY AND LICENSING

By 1987, more than 100 nuclear powerplants will be generating approximately 17 percent of the Nation's electricity. The use of nuclear power has substantially increased our energy security by greatly reducing the dependence on imported oil. A maximum of 14 additional units are scheduled to come into operation in the United States between 1987 and 1992.

Even with this impressive use of nuclear power, further deployment of this important energy option is threatened. One of the major reasons is the U.S. regulatory system, viewed by many as slow, cumbersome, and ineffective. The central requirement in the Federal regulatory scheme is to assure public health and safety through regulation of nuclear powerplants. Effective regulation consists of a technical component and an understanding of economic impacts of the means used to regulate. The changing positions, policies, and regulations affecting the LWR industry have rendered the technology of decreasing value to end users. Clear and consistent policies and supporting technical bases for LWR construction and operation will provide the framework for a coherent regulatory policy at both the Federal and state levels. Industry must be able to meet the legitimate requirements of regulators at the state and Federal level. However, the regulatory process itself needs to be more responsive to the energy needs of the next decade and beyond by dealing with safety and licensing matters on a rational, risk-based technical approach.

One of the tasks in this program area is a continuation of the severe accident technology program. Fuel damage testing conducted during prior years culminated in completion of the Loss-of-Fluid-Test (LOFT) program in FY 1986. That program provides the basis for further evaluation of fuel damage tests conducted under cooperative programs with other nations. The focus of follow-on work in FY 1987 will be to translate the results of LOFT program results into sound models and data generally accepted by the technical community as appropriate for use in the licensing process.

The overall goal is to develop and apply a severe accident methodology that incorporates results of all recent experimental work and an understanding of the ability of operator actions to reduce the consequences of accidents through more informed decisionmaking in the control room. Effective consensus in this area is crucial to regulatory reform and a better understanding of the requirements for emergency preparedness at both the local and Federal level.

In addition, risk-based licensing techniques will be developed and coordinated with the Nuclear Regulatory Commission's policy on severe accidents. General agreement has been reached on the use of risk-based techniques, and application of such techniques to achieve improvements in the regulatory process is growing. What remains to be done is to apply these techniques in the consideration of design choices for future reactors. Procedures for considering alternative design features or alternative means of complying with safety standards will be developed and applied. Work in this area will provide increased confidence that advanced light water designs meet all licensing and utility requirements for safe, reliable and economic performance.

Another important effort is a cooperative industry/government program to extend the productivity of existing and future LWR's. The equivalent of 20 new light water reactors could be realized through practical improvements in availability and lifetime of existing LWR's. Plant availability programs will be conducted in close cooperation with industry. A DOE aim is to help assure that nuclear utilities have incentives to continue extended fuel burnup previously initiated by DOE, and to apply previously obtained results. Pilot plant studies on a typical pressurized water reactor and a typical boiling water reactor will identify those components and structures that will be key in deciding to extend plant life time. In FY 1987, efforts will concentrate on technical analyses to determine key reactor plant structures and components that can continue in service beyond 40 years without replacement or refurbishment. This program could lead not only to an improved Federal regulatory approach, but could also provide a more informed bases for state regulatory evaluations of the economic and the safety impact of investments in improved plant performance.

ADVANCED LIGHT WATER REACTOR TECHNOLOGY

U.S. firms have participated in major joint programs in Japan to develop a new generation of advanced LWR's in the 1,200-1,300 megawatt electric (MWe) power range. The U.S. electric utility industry has begun a smaller effort to draw upon the results of this program, as part of an effort to set the stage for future deployment of standardized advanced light water reactors by U.S. utilities.

Work on Advanced LWRs includes R&D needed to bring forward a new generation of mid-sized LWRs. In the early 1970's, when the U.S. nuclear industry was thriving on high load growth, assumed economies of scale drove plant ratings from the intermediate range (400-800 MWe) to about 1,000 MWe. With today's pattern of lower load growth rates, plants with smaller ratings and lower total capital cost may be required to meet utility needs. The difficulty of obtaining financing for very large construction projects, impacted in part by continued changes in regulatory requirements for existing product lines, has led some U.S. reactor manufacturers to consider developing smaller, advanced LWR concepts. These designs would build on the extensive experience base from the last three decades of reactor operations but would also incorporate innovative design features. Such features could be less sensitive to changes in regulatory requirements, and also offer reduced construction periods and reduced total plant costs. Because of the relatively large resources needed to develop such designs and the uncertain potential for payoff, these innovative mid-sized LWR concepts have been developed only to a very preliminary stage. Both the market and the regulatory process are too uncertain to practically justify sufficient private sector financial investment necessary to carry the design concepts to a stage at which their potential can be adequately assessed.

In 1985, a cooperative DOE/industry program was initiated through a Memorandum of Agreement with the Electric Power Research Institute (EPRI). The objective is to assure that the lessons from U.S. past experience have been successfully applied to these new mid-sized and large LWR designs. Through the cooperative efforts of the NRC, DOE, EPRI, utilities, and suppliers, the way can be paved to complete the development and acceptance of both large and mid-sized advanced LWR's as attractive energy options for the future.

In FY 1986 and FY 1987, DOE--through competitive contracting and in cooperation with EPRI--will be providing selected technology support for these advanced designs. The important factors that will be considered in determining DOE support include the degree to which system design improvements reduce the sensitivity of plants to transients, enhance safety margins, improve use of passive safety features, simplify systems to reduce the need for regulatory involvement or oversight, improve the quality of construction, and develop a technical and regulatory basis for improved plant control. I am pleased to report that an initial selection of technical proposals has been made. Considerable industry interest was expressed in participating in a cost-shared program that will explore innovations in LWR technology to help assure that future nuclear power plants can be built on schedule, within budget and conform with the degree of safety and reliability that our citizens have every right to expect.

THREE MILE ISLAND R&D

FY 1986 R&D activities for the damaged TMI Unit 2 (TMI-2) reactor indicate successful movement by the GPU Nuclear Corporation, the nuclear industry, and government toward completing the objectives of the TMI-2 program. Defueling of the reactor has begun and shipments of core debris will be shipped to DOE's Idaho National Engineering Laboratory (INEL) for examination and storage. The current schedule calls for completion of fuel removal from the original core region by the end of FY 1986 and removal of the remaining fuel from the bottom of the reactor vessel and from the primary system components by the end of FY 1987. Data acquisition--a key element of the Department's TMI R&D effort--will focus on instrumentation and equipment performance, severe accident analyses including the behavior of radioactive fission products, data system and sample archiving, and offsite fuel debris examination. EPRI is providing mechanisms to assist in transferring this technology to industry.

Efforts in FY 1987 will be to conduct the offsite examination of the damaged TMI-2 reactor core at INEL and to transfer the technology to industry. The core examination will provide unique information on full-scale reactor behavior during severe accidents. This work will provide the necessary data for evaluating present licensing criteria and requirements; developing future licensing criteria; and assessing and developing computer models that are necessary to analyze the course and consequences of severe accidents in order to mitigate the effects of such accidents. This program will be completed in FY 1988.

ADVANCED REACTOR RESEARCH AND DEVELOPMENT

At the request of the Secretary, the Energy Research Advisory Board (ERAB) convened a Civilian Nuclear Power Panel in October

1985 to review and comment on the Office of Nuclear Energy's draft Strategic Plan for Civilian Reactor Development. The essence of the draft Strategic Plan is to establish an agenda of requisite actions and tasks to develop advanced reactor systems that can be acceptable and competitive in a future market. While the pace of the program to fulfill that agenda must be adjusted to accommodate national priorities and funding constraints, it is the Department's intent to continue to operate our unique liquid metal reactor test facilities and to conduct the R&D leading to licensing and potential commercial deployment of advanced reactor systems at an appropriate time in the future. A revised Strategic Plan, based on consideration of comments received from the ERAB Panel, Congress, and others, will be valuable in guiding and focusing DOE's reactor development programs, in helping assure complementary efforts by the private and public sectors, and in maintaining goals and objectives to ensure effective utilization of public funds.

In FY 1986 work will continue on the development of LMR and HTGR designs and their supporting R&D activities. These designs emphasize competitive economics, greater reliance on passive safety, increased tolerance to off-normal events, improved licensability, and shorter construction times. This advanced reactor systems program is aimed at providing alternative means of economic electricity production in the future, including the use of breeder reactors when the market so dictates. Advanced plant design activities are placing emphasis on refining system concepts and plant arrangements. Evaluations are being conducted to enhance the ability of these designs to meet these objectives. FY 1987 will see a further focusing of our effort on key economic and safety aspects of these designs.

Reviews of the advanced designs and licensing interactions have been conducted by NRC, and responses have been received regarding the innovative safety approach adopted for these designs. Safety analyses are being prepared for both the HTGR and LMR designs and will be submitted to the NRC by the end of FY 1986 to support the preparation and issuance of a Preliminary Safety Information Document, which will be the basis for a formal opinion by NRC concerning licensability.

R&D support is being conducted in the areas of long life metal and oxide fuels, materials, advanced component development, development of passively safe reactor shutdown and heat removal systems, advanced plant control systems, inherently safe core designs, and core modification to meet specific program needs. Test support at our facilities is being provided in the areas of long-life core development, inherent safety testing, seismic response, thermal/hydraulic analysis, and system transients.

The advanced reactor program for FY 1987 and beyond builds on the substantial progress made by advanced reactor technology and design R&D over the years. The most important elements of the existing program, including some international activities, are retained, while a portion of the technical capability of the laboratories and test facilities is made available for use in pressing near-term space and defense applications. Safety systems design, advanced fuel cycle concepts, and plant technology R&D are important elements.

Passive safety features are being incorporated into the advanced reactor designs and will reflect advances being made in fuels and core designs. This will significantly reduce the likelihood and consequences of plant failures. Key related activities will be the completion of transient tests in the Fast Flux Test Facility (FFTF) and transient overpower tests in the Experimental Breeder Reactor II (EBR-II). The safety systems design activity incorporates the integration of state-of-the-art technology in communications, controls, and operations into advanced reactor designs. Work next year will include development of man/machine interface criteria and testing methodology for civilian power, space and defense reactor needs. The advanced fuel cycle activities will continue the progress made towards the objective of extending core life to at least 3 years. The potential exists to achieve much longer core lifetimes with attendant economic benefits. Metal fuels work will be directed to establishing technical feasibility and potential to improve safety margins, fuel cycle costs, and improved proliferation resistance.

The plant technology efforts are focused on supporting the design of a standardized, modular plant that can be shop fabricated. Studies of advanced concepts have shown that standardization can eliminate up to 80 percent of indirect engineering costs. Modularity and shop fabrication are expected to provide labor cost savings. The FY 1987 R&D program will include activities in the areas of seismic/shock testing, fuel performance testing, passive decay heat removal, core thermal-hydraulic testing, circulator/pump development, and plant and rod control systems and materials.

Cooperative testing, design, and analytical programs on the breeder and other reactors with European nations and Japan are being continued, including private sector interactions, in the areas where the applications of results serve our prospective advanced commercial reactor needs.

The advanced civilian reactor development program has embarked on a course destined to develop advanced nuclear systems that meet market demands. Our rate of progress on that course must be tempered by fiscal constraint. However, we have made important progress and our resolve to meet our objectives is undiminished.

SPACE AND DEFENSE NUCLEAR POWER SYSTEMS

The Space and Defense Power Systems program is structured to respond to requirements identified by the National Aeronautics and Space Administration (NASA) and the Department of Defense (DOD), including the Strategic Defense Initiative Organization (SDIO). Program activities will provide the design, development and supporting technology for building compact, high performance reactors for space and terrestrial applications and dynamic isotope power systems for space application. This work is divided into the SP-100 Space Reactor Project, the Multimegawatt Space Nuclear Power Program, the Dynamic Isotope Power System (DIPS), the Small Nuclear Power Source (SNPS) Demonstration Project, and the Multimegawatt (MMW) Terrestrial Nuclear Power Program. A discussion of each follows.

SP-100 SPACE REACTOR PROJECT

The SP-100 Program was initiated in February 1983, when DOE, NASA, and the Defense Advanced Research Projects Agency (DARPA) formally agreed to jointly investigate, fund, and--if warranted--develop Space Reactor Power System Technology. The SP-100 Program is a three-phase effort.

Phase I (Technology Assessment and Advancement, FY 1983-1985) involved the investigation of concepts, the assessment and advancement of critical technologies, the establishment of technical and safety feasibility, and the selection of one power system concept for further engineering development and ground demonstration testing at a selected DOE test site during Phase II. This phase was successfully completed in FY 1985.

Phase II (Technology Flight Readiness, FY 1986-1991) involves civil and military mission analysis and requirements definition; detailed design, engineering development, and ground testing of the selected power system concept to demonstrate its safety, performance, dependability, and readiness for dedicated flight use; and pursuit of even more advanced aerospace technology which could further enhance an SP-100 system in the longer term.

Phase III (Flight System Production, Qualification, and Flight Demonstration/Application, approximately FY 1991-1993) will involve flight system fabrication; ground-based flight qualification testing; spacecraft and launch vehicle integration; launch; and actual space flight demonstration/application.

Phase I efforts culminated with the selection of a concept for further engineering development and demonstration testing during Phase II. The selected concept employs a compact, liquid metal cooled, fast-spectrum reactor with out-of-core thermoelectric power conversion. It will be designed, built, and tested at a reference power of 300 kilowatts electric (kWe). In November 1985, DOE selected the Hanford, Washington, facility as the preferred site at which to conduct the reactor ground demonstration testing.

A Request for Proposals (RFP) was issued in November 1985 to secure a system development contractor from industry by September 1986. That contractor will be responsible for designing, fabricating, and directing the ground testing of a prototype space reactor and other key subsystems. This effort will involve analysis and testing sufficient to demonstrate system performance, safety, dependability, and flight readiness. As an option, this effort additionally includes the provision to produce flight units and provide all the support necessary to expedite a flight program when the initial user commitment is finalized.

Programmatically, a Memorandum of Agreement to establish, manage, and implement the Phase II technology flight readiness program was signed by DOE, DOD, and NASA in early October 1985. Specifically, DOE is responsible for the ground engineering system development. The SDIO is responsible for overall program direction and--with the Air Force as its executing agent--military mission analysis and requirements definition. NASA is responsible for civil mission analysis and requirements definition, as well as for advanced aerospace technology that could ultimately enhance an SP-100 system.

A planned 300 kWe SP-100 nuclear electric propulsion flight demonstration for SDIO in the early 1990s timeframe was established in September 1985. This reference mission will serve to demonstrate and flight qualify SP-100 for follow-on dedicated mission use. Preliminary reference mission planning will be completed in mid-1986. Funding for this planned flight demonstration has been programmed by the SDIO in their outyear budget projections starting with FY 1987.

The Department is committed to the SP-100 Ground Engineering System (GES) development and testing project as are our other SP-100 partners. Its success will provide a new energy option to mission users in the 1990's and beyond.

MULTIMEGAWATT SPACE NUCLEAR POWER PROGRAM

The need for powerful new, space-based defense weapons and surveillance systems for protection against the threat of nuclear missiles has been established as a top national priority. The proposed weapons and surveillance systems require large amounts of electrical power, significantly more than can be provided by current power systems.

The SDIO has established a program to develop nuclear and nonnuclear systems that can separately or in combination meet the SDI multimegawatt power requirements. Responsibility for developing nuclear power system concepts and technology has been assigned to DOE. The Air Force has been assigned responsibility for nonnuclear power systems development.

A key objective of the MMW Space Nuclear Power Program is to identify and develop at least one space nuclear power system concept by 1991 that alone, or in combination with a nonnuclear power system, meets SDI MMW power requirements and for which technical feasibility issues have been resolved.

To meet the SDI requirements for safe, reliable, compact MMW power sources, significant advances in space nuclear power technology must be achieved. SDI missions such as space-based defense weapons, imaging radars and electric propulsion have high electrical power requirements: hundreds of megawatts for up to 2,000 seconds (burst mode) for some weapons; tens of megawatts for up to 1 year total operating time (alert mode) for imaging radars, weapons readiness, and electric propulsion; and hundreds of kilowatts to a few megawatts for as many as 7 years (continuous mode) for station-keeping activities and surveillance.

During FY 1985 and FY 1986, the program focus has been on developing a MMW Space Nuclear Program Plan and on assessing and investigating various system concepts and related critical technology areas that must be advanced if these reactor system concepts are to be able to meet the power, mass, volume, and longevity requirements of the SDIO. The program plan addresses system requirements, and provides concept and technology overview, program strategy, costs, schedules and milestones, as well as concept and technology developing activities. Work under the plan was initiated in FY 1986.

The FY 1987 effort will continue the evaluation and development of potential multimegawatt space power concepts. In addition, work will continue on experimental testing and development of key enabling technologies that are required if the preferred concepts are to become fully viable. These experimental testing and development efforts will focus on advanced nuclear fuels, materials, safety, and reliability. Advanced reactor control techniques and neutronics, shielding and thermal hydraulic codes will also be developed.

DYNAMIC ISOTOPE POWER SYSTEM

The needs of military spacecraft in the planning process include higher power requirements and increased survivability to threats directed at disablement or destruction of the space system. The current standard spacecraft power source, arrays of photovoltaic cells, lacks required features of hardness and has too much volume that could constrain the maneuverability of these new space systems. One class of spacecraft of current interest for high priority missions, requires power in the range of 1 to 10 kilowatts of electrical power; stringent attitude control and station keeping; and survival from the threats projected for the 1990 time period. In order to make certain that a highly reliable and efficient isotope powered system in the one to ten kilowatt electrical range is a viable option for military planners, a joint DOD/DOE program is being initiated.

The dynamic isotope power system (a combined turbine alternator, isotope-fueled power subsystem) is an enabling technology for these military space missions which require survivability against various threats, higher power missions performance, and a small power supply to improve the spacecraft sensors field of view and overall spacecraft pointing accuracy. DOD missions such as the Boost Surveillance and Tracking Systems (BSTS) are currently under active mission requirements definition and analysis as part of the SDI program. All of the DOD contractors have recommended the DIPS as the primary power source for the BSTS application.

The goal of the DIPS program is to develop and demonstrate the necessary technology required to provide this type of space electrical power in the range of one to ten kilowatts output for use by these types of emerging military space missions in the mid 1990's and beyond. The specific objective of this development program is to develop the DIPS as a viable enabling technology as the electrical power supply for the SDI space surveillance spacecraft.

SMALL NUCLEAR POWER SOURCE DEMONSTRATION PROJECT

There is a military, and potentially a civilian, need for ground-based power systems that can operate continuously in harsh environments with minimum attendance and freedom from the need for frequent replenishment of fuel supplies such as diesel oil. These systems must have high reliability, low maintenance, long lifetimes, and simplified logistics. Nuclear reactor technology appears to offer feasible and improved alternatives to conventional power systems for such applications as the North Warning System, which is the upgrade of the Distant Early Warning (DEW) line across northern Canada.

Because of the logistics and resupply costs of maintaining diesel generators a reactor power system is being considered as an alternative. Such a reactor system would require only minimum maintenance, and it would potentially result in significant savings in operation and maintenance costs and in overall life cycle costs. An assessment of the concept was undertaken in FY 1984. Based on the positive findings of that assessment, conceptual design efforts on reactors for the North Warning System (now called the Small Nuclear Power Source Demonstration

Project) were initiated in FY 1985. The Department of Energy, the United States Air Force (USAF), and Atomic Energy of Canada, Limited (AECL), are jointly funding a program to investigate and demonstrate the feasibility of using a 15 kWe reactor power source for an application such as the North Warning System. In FY 1986, the design is being completed, component development testing is underway, and the demonstration reactor is being fabricated.

In FY 1987, zero power tests will be conducted on the nuclear and heat pipe subassemblies to verify the neutronics performance of the subsystem. The complete system will be installed in a test cell at AECL's Whiteshell facility and system startup tests will be initiated in early FY 1988.

Basically, all of the system components use state-of-the-art technology that has been used in other systems. For example, the nuclear fuel will consist of pellets of the type used in high-temperature gas-cooled reactors, and the organic rankine cycle will be similar to those used on fossil-fueled generators for communications on the Alaskan oil pipeline and for waste heat recovery on several industrial processes. The initial objective of the program is to place a demonstration reactor in ground testing by late FY 1987.

MULTIMEGAWATT TERRESTRIAL NUCLEAR POWER PROGRAM

In response to interest by the Air Force (as well as SDIO) an effort is underway which will lead to the design of a hardened nuclear powerplant with a nominal 10 MWe rating. This plant will feature a passively safe design, a capacity factor in excess of 90 percent, refueling intervals which could range from 4 to 10 years, and will be hardened against specified military threats.

The SDIO has expressed interest in such a nuclear powerplant for its ground-based applications. These applications include the command, control, and communications systems that must operate reliably in a hostile environment if the total SDI system is to be credible. The source of power for these systems must be relatively invulnerable to terrorism, sabotage, and electromagnetic pulses from high altitude nuclear detonations as well as to acts of nature, e.g., lightning strikes, snow, windstorms. As the SDI system emerges, it is possible that a significant portion of the detection and weapon systems will be ground-based rather than space-based; these systems will need power supplied from dedicated, secure, and reliable powerplants.

Conceptual design studies of a secure military nuclear powerplant have been performed and found to show that the concept is sound. A request for proposal for advanced design of the plant has been prepared. In late FY 1986 up to two concepts will be selected for detailed design; the preliminary design will be completed by the end of FY 1987.

ADVANCED NUCLEAR SYSTEMS

The responsibility of the Advanced Nuclear Systems program is to develop, demonstrate, and deliver radioisotope power sources for U.S. military and civilian space and terrestrial missions. A recent dramatic application of RTGs was the Voyager 2 fly-by of Uranus--a planet so far from the Sun that it receives less than 0.3 percent of the sunlight received at Earth. In such a region of dark space, nuclear power is the only option for planetary explorers. The RTGs on Voyager 2 are still performing well above the prelaunch predictions over eight years after launch. NASA plans to continue to use RTGs on their next generation of planetary explorers (Mariner Mark II) planned for the 1990s.

Today, RTGs have been built with power levels over 300 watts, so that several could be ganged to provide up to a kilowatt or more of electrical power. Recognizing the usefulness of isotope power, DOD and DOE signed an umbrella agreement in 1985 to foster work on isotope power systems. A supplemental agreement has been prepared to support the BSTS. In cooperation with the Air Force, DOE is planning to develop the dynamic isotope power system for BSTS. However, current Air Force plans call for flying an early BSTS flight experiment to test out the system. Because the flight experiment may require less power than the operational satellites, RTGs are a logical choice to provide dependable, survivable electrical power.

A major effort under the RTG program has been the design, fabrication, and delivery of isotopic power supplies, safety analyses, and planning of launch support activities for the NASA Galileo and Ulysses missions. The four General Purpose Heat Source (GPHS) flight RTGs, including one spare, and 110 radioisotope heater units for thermal control of spacecraft components, have been delivered. Following these mid-1987 NASA launchings, DOE will support the mission by continued testing of the qualification and engineering units of the RTGs, analyze RTG mission performance data, and provide NASA with periodic long-range predictions for mission planning.

In looking forward to future NASA and DOD space missions, DOE is continuing to pursue the technology and the development of an advanced RTG that offers promise of higher power density and greater size adaptability as mission requirements change. This Modular Isotope Thermoelectric Generator (MITG) will enable NASA to accommodate a range of interplanetary missions identified by the Solar System Exploration Commission of the NASA Advisory Council. The MITG is also a potential power source for the experimental flight of the BSTS for the SDI program. In parallel with the MITG development, DOE is continuing its efforts to improve thermoelectric conversion efficiencies, including silicon germanium optimization, electrical contacting, evaluation of materials properties, degradation mechanisms, and material interactions.

To respond to future RTG delivery requirements, it is essential that DOE not only maintain a viable heat source production capability within its laboratory structure but also continue those efforts necessary to improve heat source safety, improve production efficiency to reduce heat source costs, and continue work in long-lead areas. In FY 1987, the Mound Laboratory (Mound) near Miamisburg, Ohio, must begin the facility and tooling modifications for the assembly and testing of a planned terrestrial RTG delivery to DOD in late 1988. Also in 1987, Mound will start the design and safety qualification process for a small, sealed, heat source needed for the Special Applications program. We plan that the Oak Ridge National Laboratory (ORNL) will continue its heat source materials program, where improved processes and forming techniques show promise of lower unit cost for heat source iridium encapsulating material.

To meet our obligations to deliver low-wattage RTGs for terrestrial military missions, the Special Applications program will continue its efforts to develop and demonstrate the necessary technology. During 1987, an RTG demonstration system test will be continued to verify long-term performance predictions. Also, thermoelectric modules of primary and alternate designs will be tested under selected environmental conditions to support RTG performance predictions and reliability analyses.

FACILITIES

DOE and its contractors operate some of the most advanced and sophisticated nuclear test facilities in the world today for advanced power generation reactors, fuels, components, and materials. The facilities provide unique testing capabilities required for the development of safe, reliable, environmentally acceptable and efficient nuclear energy power sources that will be suitable for civilian power generation, space, and military applications. These facilities are also used in the development of fusion technology; cooperative technology programs with other countries; non-nuclear energy programs such as coal, solar, and geothermal; and conducting tests for other Government and private sector organizations such as EPRI and the NRC.

These facilities include the LMR irradiation facilities--the ERB-II, the Transient Reactor Test (TREAT) facility, the Zero Power Plutonium Reactor (ZPPR), and support facilities at the Argonne National Laboratory near Idaho Falls, Idaho (ANL-West); the FFTF at the Hanford Engineering Development Laboratory (HEDL) near Richland, Washington; and the comprehensive non-nuclear liquid metal component test complex at the Energy Technology Engineering Center (ETEC) near Canoga Park, California. At the heart of the facility capability are experienced engineers, scientists, technicians, and operators. In recent years, the program has markedly improved the efficiency of its facilities. Non-essential facilities have been shut down and operations of remaining facilities have been improved. This effort is continuing in order to assure that this essential activity is carried on at the lowest possible cost.

The accomplishments and activities of our facilities and test programs are significant and include: (1) the FFTF has achieved a world record for continuous operation of an LMR at full power (101 days), demonstrating the outstanding reliability of LMR's;

(2) fuel performance in the FFTF has gone well beyond the burnup goal of 80,000 megawatt days per metric ton; (3) successful testing in the FFTF of inherent safety features and advanced control concepts; (4) the recent successful completion of a loss-of-flow without reactor scram test from 100 percent power in the EBR-II, which further attests to the passive safety capability of liquid metal cooled reactors; and (5) testing at ETEC is currently making significant contributions to LMR designs resulting from their natural circulation tests, advanced shutdown heat removal tests, and performance testing of advanced steam generators. Continued operation of FFTF, EBR-II, and ETEC continues to contribute to U.S. liquid metal reactor operating experience.

In FY 1987, the facilities will continue to support the changing civilian, military and space nuclear power requirements. Civilian advanced reactor concepts will require special tests for evaluation of fuels performance and reactor dynamics. Irradiation testing is assuming a more critical position in analysis of materials and fuel performance for military and space reactor applications.

The test programs planned for FY 1987 include reactor safety and fuel performance and component testing for advanced reactor concepts, irradiation of candidate core materials for space reactor use, irradiation of SP-100 fuel and cladding, run-beyond-cladding breach, operational transient testing under the joint United States/Japan Cooperative Program, irradiation of material specimens for the United States and Japan, and fusion programs and tests supporting reactor plant simplifications and cost reduction features.

The Department plans to evaluate the current methods by which users share in facility costs. Alternative cost-sharing approaches will be evaluated for partial implementation in

FY 1987, with fuller implementation planned for FY 1988, if practical. Facility operations are directed toward conducting required tests to support and verify advances in fuels, core systems, materials, safety, components, and instrumentation and control systems to meet civilian, defense, and space nuclear energy requirements.

WATER COOLED BREEDER REACTOR TECHNOLOGY

One of the variations of advanced nuclear technology is the use of a uranium-233/thorium fuel cycle. The Water Cooled Breeder Reactor program has the mission of developing technology that will significantly improve the efficiency of utilizing nuclear fuel resources. The specific objective is to prove that fuel breeding can be achieved in a light-water reactor using the uranium-233/thorium fuel system. The focus of program efforts in FY 1987 will be to complete evaluation of the light-water breeder core removed from the Shippingport Atomic Power Station to verify breeding, thereby bringing this project to its planned conclusion in FY 1987.

REMEDIAL ACTION AND WASTE TECHNOLOGY

The objectives of the Remedial Action and Waste Technology Program are to treat or stabilize radioactive wastes and perform decontamination and decommissioning at contaminated DOE and legislatively-directed non-government facilities and sites; help facilitate development of a reliable national system for managing low-level radioactive wastes; and develop acceptable technologies for the treatment and immobilization of nuclear wastes. Successful execution of this program is a key part of the Department's commmitment to continue to protect public health and safety and to assure a safe and clean environment in connection with its activities.

The major Remedial Action and Waste Technology activities are: (1) the Formerly Utilized Sites Remedial Action Project (FUSRAP); (2) remedial action at Grand Junction, Colorado (Public Law 92-314 as amended); (3) the Uranium Mill Tailings Remedial Action Project (UMTRAP) for inactive uranium mill tailing sites (Public Law 95-604); (4) the Surplus Facilities Management Program (SFMP), for certain radioactively contaminated DOE facilities declared surplus and resulting principally from civilian nuclear energy programs; (5) demonstration of the solidification of high-level radioactive wastes at West Valley, New York, for final disposal (Public Law 96-368); (6) technical assistance to States and regions to assist them in developing new capacities for the disposal of low-level radioactive waste, in accordance with Public Law 96-573, the Low-Level Radioactive Waste Policy Act, and Public Law 99-240, the recently enacted amendments to this legislation; (7) development of nuclear waste treatment processes and waste forms suitable for transportation, storage, and ultimate disposal in a geologic repository; and (8) civilian byproducts utilization and applications with primary emphasis on food irradiation.

The requested funds for the Remedial Action and Waste Technology Program are distributed among the program elements as indicated in the following table.

	--($ in Millions)--	
Program Element	FY 1986 Estimate	FY 1987 Request
Remedial Action and Waste Technology		
Formerly Utilized Sites	$ 18.9	$ 25.6
Grand Junction	0.9	0.8
Uranium Mill Tailings	91.3	126.0
Surplus Facilities	39.9	56.4
West Valley	61.6	79.0
Low-Level Waste	4.6	4.0
Waste Treatment	6.2	0
Byproducts Utilization	4.8	0
Program Direction.........................	1.8	2.3
Total	$230.0	$294.1

This increase in our FY 1987 funding request is consistent with prior year projections as we move from largely planning and engineering activities into the execution phases of major projects in the next 3 years. In light of fiscal constraints, this increase is less than planned, achieved through a stretch-out of the UMTRA program discussed in more detail below.

FORMERLY UTILIZED SITES REMEDIAL ACTION PROJECT

FUSRAP provides for remedial actions at former nuclear processing facilities which became radioactively contaminated as a result of former Manhattan Engineer District or Atomic Energy Commission (MED/AEC) activities and which have not been decontaminated sufficiently to meet current public health and safety guidelines. FUSRAP also includes certain contaminated sites specifically assigned to DOE by Congress for remedial action.

To remedy the situation at these contaminated sites, either the contaminated material will be stabilized in place, with restrictions placed on the use of the site, or the contamination will be removed and disposed of at another location. Authority currently exists, derived from the Atomic Energy Act of 1954, for conducting remedial actions at 24 sites, based on a review of the involvement of the Department's predecessor agencies in activities at these sites. In 1985, this review process led to the addition, by the Department, of the following 4 sites (included in the total of 24 cited above) to the project: (1) former Bridgeport Brass Company, now a General Motors property (Adrian, Michigan); (2) former Bridgeport Brass Company, now Seymour Wire Specialty (Seymour, Connecticut); (3) National Guard Armory (Chicago, Illinois); and (4) former Metal Hydrides, Incorporated, now Ventron Division of Thiokol Chemical (Beverly, Massachusetts). Review of other sites involved in past activities of the Department's predecessors is continuing and is scheduled to be completed in 1987. This review may result in the addition of other sites to the program.

Congress added four sites in the FY 1984 Energy and Water Development Appropriations Act (Public Law 98-50), with direction to initiate a decontamination research and development project at these sites as a priority action. In the FY 1985 Energy and Water Development Appropriations Act (Public Law 98-360), Congress directed DOE to acquire the former St. Louis Airport site and use it to dispose of waste from cleanup of the nearby Latty Avenue site and vicinity properties. Congressional and Departmental additions bring the total number of sites in the project to 29.

The Department's Oak Ridge Operations Office has the lead role in implementing the Formerly Utilized Sites Remedial Action Project.

In FY 1985, the cleanup of the contaminated central drainage ditch leading from DOE-owned Niagara Falls Storage Site at Lewiston, New York, was completed for a distance of about 1 1/2 miles. In FY 1986, the Department expects to complete cleanup work at the remaining four contaminated properties near this site. Work will be completed on the installation of an interim cap on the waste storage area, about 9 months later than originally planned. This delay was due to technical problems in transferring the radium-contaminated residues from a concrete tower to a storage location and in treating large quantities of impounded water to meet stringent State standards for discharge. Other remedial actions at this site are described under the Surplus Facilities Management Program.

The Department is planning to complete the remedial actions at the Middlesex Landfill in New Jersey in FY 1986 that were about 50 percent completed in FY 1984. No cleanup work was done on this site in FY 1985. This is about 21 months later than originally planned, due to a large increase in the estimated volume of contamination and the higher priority assigned to the Maywood, New Jersey, remedial action.

Decontamination actions begun in FY 1984 and continued in FY 1985 are underway in FY 1986 at Maywood, New Jersey; Wayne, New Jersey; and Colonie, New York. The general approach to these projects is to give priority to the cleanup of contaminated residential properties and to store the waste temporarily on each processing and storage site. The cleanup of residential properties in Maywood, contaminated with material from the Stepan Chemical Company site, was completed in FY 1985, along with some residential properties found to be contaminated from the Stepan site in the adjacent town of Lodi. The contamination from the Stepan site has been found to be more extensive, extending into Lodi and under New Jersey Route 17. In FY 1986, cleanup of one Maywood commercial property continues. Extensive characterization of the contaminated areas and engineering for further remedial actions will be completed. The waste from this site is being stored on an 11.7 acre part of the Stepan Company property at Maywood which Stepan donated to DOE in 1985 along with $580,000. The storage pile was expanded in 1985 and modified to meet State requirements. The Department expects to complete a study of options for permanent disposition of the more than 270,000 cubic yards of waste later this month.

At Wayne, New Jersey, the cleanup of a ball field and a bus yard was completed in FY 1985, interim stabilization of the waste on site was begun, and onsite monitoring wells were installed. In FY 1986, about one-third of the cleanup of Sheffield Brook and cleanup of residential properties bordering the brook will be completed. Modifications are being made to the site so that wastes can be stored on the site temporarily. The site is considered unsuitable for permanent stabilization because of ground water flow. The State of New Jersey has been requested to nominate candidate locations in the State for DOE to establish a site for disposal of the estimated 50,000 cubic yards of waste at Wayne, as well as the other estimated 360,000 cubic yards of FUSRAP waste at Middlesex and Maywood.

At Colonie, New York, DOE acquired the NL Industries site as a donation in February 1984, along with two adjacent parcels owned by the Niagara Mohawk Power Company that have waste buried on them. Radiological surveys of a total of 130 vicinity properties have been completed through FY 1985, and of these, 54 properties need remedial action. About 90 to 100 additional properties remain to be surveyed. Cleanup of 35 properties was completed by October 1985 (11 in FY 1984 and 24 in FY 1985) and all remaining properties will be completed by October 1987. The contaminated soil is being temporarily stored inside the plant. Later this month we expect to complete a study of options for the permanent disposition of the more than 30,000 cubic yards of waste. The State has been requested to nominate candidate locations for a DOE disposal site in New York. In FY 1986, DOE will remove the radioisotope sources from the plant previously used for inspection work as well as hazardous chemicals in the plant.

At Hazelwood, Missouri, DOE has arranged with the site owner, Futura Chemicals Company, to use a part of the site for storage of contaminated soil. Cleanup of a portion of Latty Avenue, adjacent to the Hazelwood site, was initiated in FY 1984 and was completed in FY 1985. Border areas on the site were cleaned up to prevent recontamination of Latty Avenue, and fencing was installed around the site. Radiological surveys of the vicinity properties were performed in FY 1985, and a survey of the developed part of the Latty Avenue site will be started in FY 1986. Cleanup activities on the remaining vicinity properties will not be started until the waste can be moved to the St. Louis

Airport Disposal site. The City of St. Louis, Missouri, is considering the terms of transfer of the former St. Louis Airport Storage site to the Department for use in disposing of the estimated 60,000 cubic yards of waste from the Hazelwood site and vicinity properties, as required by language contained in the report that accompanied the FY 1985 Energy and Water Development Appropriations Act (Public Law 99-360). In FY 1985, DOE installed a 300-foot rock wall (gabion) at the Coldwater Creek bank of the Airport site to prevent erosion from spreading contamination into Coldwater Creek. In FY 1986, further site characterization (radiologic and geologic) work will be started and this work will be completed in FY 1987. Preliminary design work, initiated in FY 1986, will be completed in FY 1987.

A revision to the FUSRAP Project Plan was completed in FY 1985. A preliminary total cost estimate of $675 million has been made for the FUSRAP scope, consisting of 25 sites, based on completion of all the work by the year 2001. The Plan will be updated in FY 1986 to include the four additional sites added by the Department in FY 1985.

GRAND JUNCTION REMEDIAL ACTION PROJECT

Under Title II of Public Law 92-314, Congress authorized financial assistance to the State of Colorado to limit radiation exposure resulting from the use of uranium mill tailings for construction purposes in Grand Junction, Colorado. This State and Federal cooperative effort is administered by the Colorado Department of Health through DOE's Grand Junction Area Office. The remedial action provides for removal of uranium mill tailings from the premises of an estimated 583 structures where concentrations of radioactive radon and its decay products exceed guidelines established by the Surgeon General. Public Law 95-236 extended the time, which has now expired, for property owners to apply for inclusion and also increased the authorized funding for the program. Federal funds cover 75 percent of the program costs, with the State providing the balance. Contingent upon the availability of adequate funding from the State of Colorado, the remedial action is expected to be completed in FY 1987, with final radiological verification to be completed in FY 1988.

At the end of FY 1985, work had been undertaken on 546 structures. In FY 1986, radiological assessments will be continued, engineering on all properties will be completed, and remedial actions will be initiated at 20 additional structures, including 17 residences, 2 commercial establishments, and 1 church. In FY 1987, work is scheduled to be undertaken on 15 properties, including 6 commercial structures, bringing the total number of properties completed to 581 out of the estimated total of 583.

URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT (UMTRAP)

UMTRAP is responsible for conducting remedial action at 24 former uranium ore processing sites and several thousand contaminated vicinity properties, as mandated by Public Law 95-604, the Uranium Mill Tailings Radiation Control Act of 1978. Nine of the sites are designated as high priority, six as medium priority, and nine as low priority. The Act provides authority for remedial action by the Department for a period of 7 years following promulgation of standards by the Environmental Protection Agency (EPA), which occurred in March 1983.

The Department is proposing to extend the 7-year authorization period until the end of FY 1993, consistent with the recommendation to extend the duration of the project made by the House Appropriation Committee in House Report No. 99-195 accompanying the FY 1986 Energy and Water Development

Appropriations Act (Public Law 99-141). The FY 1987 budget request identifies resource requirements to meet this extended schedule. The proposed extension takes into consideration the actual project experience gained in performing remedial action at several processing sites and many vicinity properties. Project plans have been revised to reflect this experience, and are based on the following key assumptions: (1) 4,535 of the 8,156 designated vicinity properties will actually require clean up in accordance with EPA standards; and (2) seven of the tailings piles (i.e., Durango, Colorado; Grand Junction, Colorado; Gunnison, Colorado; Rifle, Colorado; Bowman, North Dakota; Lakeview, Oregon; and Salt Lake City, Utah) will be relocated.

The program strategy is to focus near-term program activities on the higher priority sites and on vicinity properties. Remedial actions are being conducted in accordance with cooperative agreements negotiated with the affected States and Indian tribes. Federal funds cover 90 percent of the remedial action costs (100 percent for the sites on Indian lands), and the States provide funding for the remaining 10 percent. The type of remedial action for the processing sites will be to stabilize the mill tailings in place, where possible, or to remove them to a new disposal site. In either case, the final disposal sites will be Federally owned and maintained under NRC licenses. Engineering plans and environmental documents are prepared for each site cleanup and disposal operation. Concurrence by the NRC and the affected State or Indian tribe are required for the remedial action plan at each site. The project also involves the cleanup of an estimated 4,535 contaminated vicinity properties mainly in the Grand Junction area but not covered by the Grand Junction Remedial Action Project. The Department's Albuquerque (New Mexico) Operations Office has the field management responsibility for implementing UMTRAP.

Specific accomplishments in FY 1985 included the completion of 90 percent of the remedial action at Canonsburg, Pennsylvania, and initiation of remedial action at Salt Lake City, Utah; and Shiprock, New Mexico. The implementation of the remedial action at the Salt Lake City processing site has been assigned to the State of Utah. The approach at this site is to relocate the tailings to a site near Clive, Utah. Cleanup continued at high-priority vicinity properties near the sites at Canonsburg, Pennsylvania; Salt Lake City, Utah; Grand Junction, Colorado; and Edgemont, South Dakota; and started at Shiprock, New Mexico; Riverton, Wyoming; and Durango, Colorado.

During FY 1986, work is underway or planned at five processing sites. The Canonsburg project will be completed early in the fiscal year. The work at Salt Lake City will be brought to an estimated 70 percent of completion, and the work at Shiprock will be 90 percent completed. Onsite work will be started at the processing sites at Tuba City, Arizona, and Lakeview, Oregon. Over 400 vicinity properties located at several high-priority sites will also be decontaminated.

During FY 1987, remedial action will be underway at 9 processing sites and 900 vicinity properties. The work at Shiprock, New Mexico, and Salt Lake City, Utah, will be completed. Work will continue at Tuba City, Arizona, and Lakeview, Oregon. Processing site remedial action will be started at Durango, Gunnison and Grand Junction, Colorado; Riverton, Wyoming; Ambrosia Lake, New Mexico; and Mexican Hat, Utah.

SURPLUS FACILITIES MANAGEMENT PROGRAM

This program provides for the safe management and disposition of certain surplus radioactively contaminated DOE-owned facilities from nuclear energy development activities. The decontaminated facilities and sites are to be returned to other productive use, where appropriate. (Similar actions at defense-related facilities are separately budgeted as Atomic Energy Defense Activities.) The facilities are grouped into 35 projects under this activity. This number increases by one for FY 1987 because the Department will assume the responsibility for decommissioning the Power Burst Facility in Idaho, formerly supported by the NRC. A long-range plan was completed in April 1985 to establish the overall schedule and priorities for sites currently in the surplus inventory. Priorities are established and work schedules are developed through analysis of public health and safety, legal, economic, and work continuity factors for each site. The Department's Richland (Washington) Operations Office has the lead role in implementing this program.

In FY 1985, the major onsite cleanup and upgrading of the interim storage cell was continued at the Niagara Falls Storage Site in Lewiston, New York. The remainder of the 4,000 cubic yards of residue stored in a 160-foot tower were transferred through a 3/4-mile pipeline and were excavated from the tower to a low concrete building at the waste storage area. The tower was demolished and the contaminated rubble was moved to the storage cell. A thick clay cap with a design life of greater than 25 years is being placed over the wastes to minimize water infiltration. Installation of this interim cap is scheduled for completion by the end of FY 1986. A Final Environmental Impact Statement (EIS) on the long-term management for this site is to be issued in FY 1986. In FY 1987, only surveillance and maintenance of the Lewiston site is planned. Since all offsite and onsite contamination will have been consolidated into the monitored and controlled storage cell, there will be no urgency from a health viewpoint to proceed with implementation of the long-term management option. This work will be deferred to use available funds for higher priority work.

Work on the decontamination of plutonium-contaminated facilities at Mound Laboratories will be continued in FY 1986 and FY 1987 and completed in FY 1988. This 11-year project was begun in 1978 and will continue through planned completion as a high priority.

Decommissioning of the Shippingport Atomic Power Station is another major DOE project. Following defueling of the reactor at the end of FY 1984, physical dismantling of the plant began in FY 1985. Preparations for removal of major components were begun, and some noncontaminated buildings were demolished. Dismantling of portions of the plant will continue in 1986 and 1987 and is scheduled to be completed in FY 1990. Preparation for the removal of the reactor pressure vessel will begin in FY 1987; the vessel is scheduled to be barged to the Department's Hanford Reservation near Richland, Washington, for disposal in FY 1989. The Department is cooperating with the NRC and EPRI in obtaining samples of the pressure vessel for aging studies. Other components will also be examined for this purpose. The Department is participating in a Nuclear Energy Agency-sponsored international exchange of decommissioning technology, which includes Shippingport, West Valley, and eight significant projects in other member countries.

In FY 1985, the Department continued interim site maintenance and monitoring as well as engineering and planning for the Weldon Spring Site Remedial Action Project in Missouri, a major DOE project. In addition, a Request for Proposals was issued for the remedial action project management contractor and a radiological characterization report for the Weldon Spring Quarry was completed. In 1986, field work for characterization (radiological, chemical and geological) of the Chemical Plant area will be initiated and will continue into FY 1987. Preparation of a draft EIS to be issued in 1986 is underway. The Department's preferred alternative is stabilization of the wastes on site in a disposal cell designed to meet EPA requirements for the stabilization of uranium mill tailings. The project management contractor has been selected and a DOE onsite project office will be established in FY 1986. Conceptual design engineering by the project management contractor will begin in FY 1986 and continue through 1987. The Final EIS and Record of Decision will be issued in FY 1987. Contractors will be mobilized on the site, using local area labor, and remedial action will be started in FY 1987. We estimate that remedial actions at the Weldon Spring site will be completed in FY 1995 and a final report issued by the end of FY 1996.

As previously mentioned, a new project will be added to the SFMP in FY 1987, decommissioning of the Power Burst Facility in Idaho. Current plans are to place the facility into an interim safe storage condition by initiating stabilization and fuel removal to dry storage in FY 1987. The facility is expected to be in a safe storage condition by the fourth quarter of FY 1988 or the first quarter of FY 1989. This condition will minimize surveillance and maintenance costs until funds are available for complete decommissioning, about 1993.

Other activities in FY 1987 will include continuation of site and facility disposition projects at Monticello, Utah; Santa Susana, California; the Argonne National Laboratory (ANL) in Illinois; the Oak Ridge National Laboratory in Tennessee; the Idaho National Engineering Laboratory in Idaho; and the Los Alamos National Laboratory (LANL) in New Mexico. Decommissioning of the reactor at the Center for Energy and Environment Research (CEER) in Puerto Rico will begin in FY 1986. At Monticello, Utah, mill tailings will be removed from 12 residential properties, leaving only about 6 properties to be completed in FY 1988. The environmental assessment will be completed for the Monticello mill site in FY 1986 and work on the site will start in FY 1987. Decontamination of surplus facilities at the 350 Area of the

ANL-East complex will be completed in FY 1986 and preliminary activities started for the decommissioning of the Experimental Boiling Water Reactor.

WEST VALLEY DEMONSTRATION PROJECT

The objective of the West Valley Demonstration Project is to demonstrate the solidification process for disposal of high-level liquid nuclear wastes under the provisions of Public Law 96-368, the West Valley Demonstration Project Act. An integrated production-scale development and demonstration project for treating high-level liquid nuclear wastes is being carried out at the Western New York Nuclear Service Center, near West Valley.

Major activities being performed as part of this project include: (1) demonstration required to prepare existing facilities and equipment to accommodate the solidification project; (2) removal of wastes from underground storage tanks; (3) development, design, construction, and operation of systems and necessary supporting facilities for the solidification of the wastes; (4) acquisition of containers for the permanent disposal of the solidified waste; (5) temporary storage and transportation of the solidified waste to an appropriate Federal repository for permanent disposal; (6) decontamination and decommissioning of the waste tanks, facilities, hardware, and material used in carrying out the project; and (7) disposal of low-level and transuranic wastes produced from project activities.

As the result of a detailed review, the estimate of total project costs through the waste solidification stage, excluding final decontamination and decommissioning of the facility, was reduced to $442.4 million in year of expenditure dollars. This is a decrease of approximately $30 million from the previous estimate.

Project activities in FY 1985 led to the accomplishment of the most challenging goal of the Project to date, the start of verification testing of major subsystems of the Vitrification System. Individual testing of subsystems was completed in FY 1985 allowing for the start of integrated testing of all major portions of the Vitrification System. Other accomplishments during this period included completion of cleanup of the first of several former reprocessing cells and initial testing of the overall system that will solidify low-level liquid wastes.

During FY 1986, the design of all systems necessary to convert the Component Test Stand into the final shielded Vitrification Facility will be well underway. Radioactive testing in a pilot-scale vitrification system using the West Valley formula for the high-level waste form will be conducted to support the development of operational procedures for the West Valley Vitrification Facility. The final design of the Supernatant Treatment System to pretreat and reduce the volume of the liquid high-level waste will be completed as well as the civil construction and procurement activities for this system. Installation of equipment for treating low-level liquid wastes before they are solidified in cement will be completed in FY 1986. Decontamination of needed shielded cells will be continued to meet project needs.

In FY 1987, testing of the Vitrification System will concentrate on validation of process control techniques. In parallel, structural aspects of the conversion of the Component Test Stand into the final Vitrification Facility will be completed. The Supernatant Treatment System will be installed and testing completed leading to the start of supernatant processing in mid-FY 1987. The supernate now stored in underground tanks represents nearly 90 percent of the volume and 50 percent of the radioactivity of the stored liquid waste. The separated radioactive material will be stored and later blended with the sludge from the storage tanks and glass formers prior to being fed into the melter in the Vitrification Facility. The Liquid Waste Treatment System will be completed early in the year and used to treat low-level liquid wastes resulting from operation of the Supernatant Treatment System. Decontamination of needed hot cells will continue.

LOW-LEVEL WASTE MANAGEMENT ACTIVITIES

The Low-Level Waste Program provides assistance to States and regions in developing capacities for the disposal of low-level radioactive waste, in accordance with Public Law 99-240, the Low-Level Radioactive Waste Policy Amendments Act of 1985, enacted on January 15, 1986. This legislation has assigned individual States the responsibility for the disposal of low-level wastes generated within their borders, with the exception of waste generated as a result of certain Federal activities and civilian low-level waste exceeding the limits established by the NRC for Class C low-level waste. The formation of regional compacts to carry out this responsibility is encouraged by the Act. The goal of the Department's Low-Level Waste program is to assist States and regions in the development of an effective nationwide low-level waste management system. The Act has also assigned several new responsibilities to the Department in addition to providing assistance to States and compact regions.

During FY 1986, the Low-Level Waste Program will conduct the activities required in the Act and will focus primarily on meeting the generic technical needs of the States and compact regions as they work to select sites and develop new disposal facilities. Specifically, the Department plans to concentrate on assisting States and regions in evaluating alternative disposal technologies to those currently in practice at the currently operating sites in Washington, South Carolina, and Nevada. The program will support the continued correction of problems and stabilization efforts at disposal sites no longer in operation and will continue to provide an evaluation of innovative waste treatment methods to the private sector. DOE expects to finish development of the procedures that will be used to evaluate proposals for transfer of closed low-level waste sites to the Department under Section 151 of the Nuclear Waste Policy Act of 1982.

In FY 1987, the Low-Level Waste Program will continue to provide technical assistance to States and regions to support the selection and development of new low-level disposal facilities; support the correction of problems and stabilization at existing disposal sites; and complete an assessment of advanced, innovative methods for the treatment and disposal of low-level waste. The report identifying options for the Congress on disposing of greater-than-Class C low-level wastes will be completed by January 1987.

WASTE TREATMENT

The goal of the Waste Treatment Program over the past 5 years has been to develop and transfer technologies for the treatment and immobilization of nuclear wastes in forms acceptable for transportation, storage, and disposal. Efforts have been focused on determining the long-term reliability and maintaining the ability of a prototypical high-level waste treatment system, on testing and selecting acceptable high-level waste forms for storage or disposal, and on transferring treatment technologies to specific Departmental waste management programs such as the West Valley Demonstration Project.

In FY 1986 we will complete the second year of our efforts to determine the operational reliability, safety, and process control flexibility of the ceramic melter system for solidification of high-level radioactive wastes and continue collaborative programs with the Federal Republic of Germany and Japan on testing of a radioactive vitrification system.

In FY 1987, radioactive testing of the high-level waste vitrification system at the Pacific Northwest Laboratory will be stopped unless individual users have a need for and fund additional research and development work. Reports on R&D results obtained in FY 1986 will be completed.

BYPRODUCTS UTILIZATION

In the FY 1986 Energy and Water Development Appropriations Act (Public Law 99-141), Congress provided resources for a civilian byproducts utilization program with a primary emphasis on food irradiation. We have proceeded--in cooperation with States, other Federal agencies, and private sector organizations--to develop plans and designs for establishing agricultural commodity irradiators in States selected on the basis of their needs and proximity to major agricultural production and processing centers. In anticipation of possible widespread use of food processing with irradiation, this program also focuses on developing an adequate U.S. based supply of radiation sources. Funding from the private sector will be sought for completion of these projects in future years, including FY 1987.

URANIUM ENRICHMENT ACTIVITIES

The Department's FY 1987 budget request for the Uranium Enrichment program is approximately $1.05 billion in budget authority, which will be fully offset by $1.29 billion in projected revenues. In addition, DOE proposes to return $235 million to the Treasury as a part of the repayment of prior Government investment in the uranium enrichment enterprise.

The funds requested are distributed among the major elements of the program as follows:

Program Element	FY 1986 Estimate	FY 1987 Request
	--($ in Millions)--	
Uranium Enrichment Activities		
Gaseous Diffusion Operations & Support	$1,075.0	$ 992.6
Atomic Vapor Laser Isotope Separation	127.0	50.0
Gas Centrifuge Program Closeout/Activities ..	344.4	4.0
Program Direction	4.0	4.8
Subtotal	1,550.4	1,051.4
Payback to Treasury	0*	235.0
Total	1,550.4	1,286.4
Uranium Enrichment Revenues	-1,360.6	-1,286.4
Net Appropriation	189.8	0

* Revenues in excess of outlays of approximately $110 million will accrue to the Treasury in FY 1986.

OVERVIEW

The next 2 years will be a key time period for the uranium enrichment enterprise. During this period the program restructuring which began in 1984 will continue. In the last 2 fiscal years, significant progress has been made in redirecting the enterprise to help assure its competitiveness and long-term viability in the international marketplace. Supply and demand have been stabilized by issuing the Utility Services (US) contracts and by very successfully converting existing customers to the new contracts. Having defined the customer demand that must be met through the conversions to the US contracts, the Department then developed appropriate production and R&D strategies to meet that demand and announced those decisions in June 1985.

Through revision of the Uranium Enrichment Services Criteria, the ground rules under which the enterprise will operate in the future will be refined. The Department will initiate payments to the Treasury in recovery of prior unrecovered costs.

A new initiative now under review is an effort to transfer future development and ultimate deployment of the AVLIS technology to the private sector. The areas in which the private sector can most beneficially be involved in the enterprise will be evaluated. At a minimum, it is hoped that the private sector will be interested in deploying the AVLIS technology. This advanced method of enriching uranium holds significant technical and economic potential for the United States and should provide the type of challenge which the private sector has demonstrated its capability to meet. In that light, the Department will initiate later this year an industrial access program to allow qualified U.S. firms to become familiar with the AVLIS technology so that there is an assured industrial base to deploy the technology in the future.

We believe the prospects for a bright future for uranium enrichment in the United States continue to improve. It is clear that the changes made the last few years were necessary. The enterprise is becoming much more cost competitive in operating the existing gaseous diffusion plants and is continuing the development of the world's most advanced enrichment technology for the future. However, there is more to be done. In FY 1987, the Department will develop the institutional framework that will assure that the Nation continues to have a reliable supply of enrichment services for the long term. We must continue to pursue vigorously a restructuring of the enterprise and the involvement of the private sector to assure that the optimum benefits of the strategy on which we embarked several years ago are achieved. A brief review of the elements of that strategy follows.

OBJECTIVES

Our primary objective is to retain a competitive, financially healthy uranium enrichment supply capability in the U.S. for the long term consistent with the Atomic Energy Act, other legal requirements, and the interests of the Nation.

The major goals which have been established for the U.S. uranium enrichment enterprise, as articulated in the June 1985 strategy, include:

- to bring supply and demand of DOE-origin enriched uranium into balance;
- to offer reliable customer services;
- to offer competitive prices;
- to capture uncommitted market consistent with financial interests;
- to minimize the cost of operating existing enrichment plants;
- to retain the U.S. leadership in advanced technology and deploy as appropriate to meet business objectives; and
- to adopt a more businesslike institutional structure.

Important progress has been made toward achieving these goals. A summary of some of the more significant accomplishments during the past 2 years follows.

BRING SUPPLY AND DEMAND INTO BALANCE

The US contracts, introduced in January 1984, were a major step which have enabled the enrichment enterprise to compete more effectively in the international marketplace. About 90 percent of DOE customers converted to these contracts. They have brought stability to our projected sales base and corresponding revenues. They have permitted DOE customers to reduce enriched and natural uranium inventories, and produced a more orderly market serving the nuclear fuel cycle.

Subsequently, representatives of the uranium mining industry brought suit against DOE based on the procedures which were used to introduce the terms of the new contract form. Litigation concerning the US enrichment contract is proceeding in both the U.S. District Court for the District of Colorado and in the U.S. Court of Appeals for the Tenth Circuit. DOE has noticed its appeal of the judgment of the district court in which the court ruled that the US contract was null and void.

OFFER RELIABLE CUSTOMER SERVICES

Reliability of supply is a term we hope will become synonymous with U.S.-supplied enrichment goods and services. We strive continually to offer the world's most reliable enrichment services and to respond quickly to changes in the marketplace. We believe this is a significant factor in utility decisions, both here and abroad, to contract with DOE for their enrichment services.

OFFER COMPETITIVE PRICES

A crucial element of our competitive strategy is the approach to pricing. The market is extremely price sensitive and DOE prices must be competitive. The key to the survival of the U.S. uranium enrichment business is to get near-term prices down into the competitive range by aggressively reducing costs.

The price for US contract holders in 1985 was $135 per separative work unit (SWU). In announcing the June 5, 1985, enrichment program decisions, Secretary Herrington pointed out that maintaining the DOE price at uncompetitive levels was, in effect, a going out of business strategy. On October 1, 1985, a price reduction to $125 per SWU became effective. This price is still significantly higher than those currently offered by competitors. Accordingly, DOE has announced its plans to continue its price reduction policy by offering a FY 1987 base price of $119 per SWU effective October 1, 1986.

This declining pricing pattern for the U.S. adds credibility to plans for even lower prices in the future. The results of not following a competitive pricing strategy would have serious impact on the enterprise. It is estimated that DOE would lose about $7 billion in revenues between now and the year 2000 if it were to keep prices at the current $125 per SWU level. Thus, our pricing policy is crucial to the competitive strategy.

CAPTURE UNCOMMITTED MARKET

During the past year, we have taken strong actions to revitalize this country's uranium enrichment enterprise. Most notably, through several creative marketing initiatives, we were able to increase our share of the free world enrichment market from 46 percent in 1985 to 53 percent in 1990.

In 1985, there remained 6 million SWU's of uncommitted sales opportunities with DOE enrichment customers available from FY 1987 through FY 1990. During this period, DOE has excess production capacity that could produce SWU's at low marginal costs. To allow its customers to benefit from this capability, in April 1985, DOE offered an incentive price of $90 per SWU to customers with uncommitted sales in FY 1987 through FY 1990. This incentive pricing offer proved very successful--nearly 87 percent of DOE customers with uncommitted requirements accepted the incentive price proposal. As a result, DOE sales for FY 1987 through FY 1990 time period increased by 14 percent, or over 5 million SWU's.

In 1986, we hope to solidify and increase our market share for the period 1991-1995. By April 1, 1986, DOE customers must decide how much of their fuel supply they will take from DOE in FY 1991. Over 25 percent of DOE's US contract enrichment demand is uncommitted from FY 1991 through FY 1995. Total sales opportunities are about 20 million SWU's with a sales value of about $2 billion.

In light of our previously successful pricing effort, we have made a new incentive pricing offer to our customers. In return for customer commitments to purchase 100 percent of their enrichment requirements from DOE in the 5-year period from FY 1991 to FY 1995, DOE has proposed a price of about $85 per SWU for the remaining 30 percent fraction of their enrichment requirements. Under US contracts, 70 percent of the customers' enrichment requirements would be priced at the DOE base price.

I am pleased to announce that we have had a very favorable response to our incentive price offer. Those customers who took advantage of this highly attractive offer represent about 75 percent of DOE's uncommitted sales opportunities in the FY 1991-1995 time period.

We plan to continue aggressive market initiatives in the future to increase DOE's market and revenues, discourage competitor investment in new capacity, improve the U.S. trade balance, prevent competitor penetration of DOE's market share, and effectively utilize excess DOE production capacity. In addition, a larger sales volume to DOE will result in lower unit production costs which could be passed along to all customers in the form of lower prices.

MINIMIZE COSTS OF EXISTING PLANT OPERATIONS

Because minimizing the cost of existing plant operations is key to near term DOE price competitiveness, Secretary Herrington decided in June 1985 to place the Oak Ridge (Tennessee) Gaseous Diffusion Plant in standby status at the earliest possible date. This major, near-term cost reduction decision followed extensive analysis that showed that about $250 million could be saved between FY 1986 and FY 1991 by taking that action. The Oak Ridge Gaseous Diffusion Plant has been in standby status since August 1985, and will remain in that condition with the DOE Office of

Defense Programs providing the standby funding because of projected defense demands for enriched uranium in the outyears. If the standby funding is not provided, the plant will be shut down permanently. If the plant is permanently shut down, it will not be operable because critical components will no longer be maintained.

The costs of operating the Portsmouth and Paducah Gaseous Diffusion Plants (GDP's) were also reduced in FY 1985. New and innovative ways of operation, coupled with the use of lower cost unfirm power which is about 30 percent cheaper than firm power, improved the economics of operating the GDP's. Significant savings have been demonstrated through the use of low-cost evening, weekend, and offpeak seasonal power. It is planned to continue to take advantage of this lower cost, unfirm power to the maximum extent possible in the future.

Another strategically necessary but very difficult cost reduction decision was the termination of the GCEP project. After extensive analyses, the Department concluded that any GCEP completion scenario that required the outlay of significant amounts of additional capital was unjustifiable from an investment point of view. Simply put, the best GCEP scenarios resulted in production costs that were about equal to the production costs of the GDP's that are operating today, and all GCEP scenarios involved greater technical and economic risks than continued GDP operation.

Closeout of GCEP-related activities is proceeding well and DOE is working diligently to identify alternative uses for the GCEP equipment and facilities as well as other centrifuge facilities throughout the country.

RETAIN U.S. LEADERSHIP IN ADVANCED TECHNOLOGY

The U.S. currently enjoys a commanding lead in developing the world's most advanced enrichment technology, the AVLIS process. We plan to maintain that lead to assure that, even when other countries decide to deploy AVLIS, the U.S. will have a more advanced, lower cost process on line.

The figures of merit that favored the selection of AVLIS over the Advanced Gas Centrifuge for further development clearly showed its greater potential for low cost and reliable production for the future. The AVLIS technology is less capital intensive, requires significantly less investment prior to a decision to deploy, has a lower estimated SWU cost, has greater potential for cost reductions through technology improvements, and is more adaptable to deployment in increments that can match the evolving needs of the enrichment marketplace.

In FY 1985, the one-half scale MARS separator was successfully integrated with the first phase of the Laser Demonstration Facility for enrichment tests. Test results will establish an experience base in the operation of large scale integrated hardware as well as calibrate the consistency between model prediction and measured enrichment performance. The near full scale Materials Handling Demonstration Module was operated continuously for over 100 hours, thereby establishing the initial key segment of materials handling technology for design and operation of a full-scale separator pod.

In FY 1986, these facilities will be used to demonstrate enrichment for extended periods of time and to demonstrate the materials handling capability of this subsystem. Attention will focus on resolution of issues identified by the Process Evaluation Board as being technically critical or having high economic leverage.

Ultimately, the successful deployment of AVLIS will depend in large measure on the existence of qualified industrial capability to carry the AVLIS technology out of the laboratory and into commercial operation. Accordingly, we will be instituting an industrial access program for AVLIS this year in an attempt to develop a knowledgeable industrial base for deployment.

RECOVERY OF PRIOR GOVERNMENT COSTS

The Government's outstanding investment will be recovered in a manner that will assure that commercial and military customers will continue to obtain competitively priced enrichment services. The Administration is committed to the recovery of appropriate Government costs over a reasonable period of time as required by the Atomic Energy Act. DOE will return to the U.S. Treasury, over a reasonable period of time, previously unrecouped and unrecovered costs associated with the provision of enrichment services to civilian customers. The outstanding Government investment will be reduced from $7.5 billion to approximately $3.5 billion by an amount equivalent to 60 percent of the GDP's that are no longer an earning asset and the entire GCEP, which never was and never will be an earning asset. These assets are not being used to provide enrichment services for the benefit of commercial customers. In addition, the outstanding investment will also be reduced by amounts equal to imputed interest charges after these assets were deemed to be "nonearning." These amounts are shown on the table below.

	($ in Millions)
Total Government Investment	$ 7,573
Less: 60% of GDP investment	1,200
GDP imputed interest	193
GCEP investment	2,589
GCEP imputed interest	110
Total Unrecovered Investment	$ 3,481

Imputed interest on the outstanding investment made prior to October 1, 1986, will be computed at an interest rate of 6.319 percent--the average of Treasury rates applicable in the years in which net increases in Government investment occurred, weighted by the dollar amount of these annual increases.

Payments to Treasury will be set for each fiscal year and the subsequent year through the annual budget process. The Department plans payments to the Treasury of $110 million in FY 1986 and $235 million in FY 1987.

MODIFICATION OF THE URANIUM ENRICHMENT SERVICES CRITERIA

One key action recently initiated by DOE is the proposed modification of the Uranium Enrichment Services Criteria. A Notice of Proposed Rulemaking was published in the Federal Register on January 29, 1986. The proposed Criteria modification addresses: (1) items that were questioned in the miners' lawsuit; (2) other aspects of the enterprise, including flexibility for future competitive actions; and (3) reiteration of the Administration's position opposing restrictions on the enrichment of foreign natural uranium.

We hope to complete the rulemaking process by the end of summer. All interested parties will have an opportunity to comment on the proposed Uranium Enrichment Services Criteria, both in writing and at a public hearing.

Subsequent to the review and consideration of public comments, DOE will submit the revised Uranium Enrichment Services Criteria to Congress at least 45 days prior to their actual effective date pursuant to Section 161(v) of the Atomic Energy Act.

This completes my statement. I would be pleased to respond to any questions you may have at this time.

BIOGRAPHICAL SKETCH

JAMES W. VAUGHAN, JR.

Mr. James W. Vaughan, Jr. assumed the position of the Principal Deputy Assistant Secretary for Nuclear Energy, Office of Nuclear Energy, at the U. S. Department of Energy (DOE) in March 1984. In this position, he oversees the technical management and programmatic direction of all programs assigned to the Assistant Secretary for Nuclear Energy.

Prior to his appointment as Principal Deputy, Mr. Vaughan had served since 1979 as Deputy Director of the Naval Nuclear Propulsion Program, a joint Department of Energy and Department of Navy effort currently headed by Admiral K. R. McKee, Deputy Assistant Secretary for Naval Reactors and Director, Naval Nuclear Propulsion Program. In that position he was the senior civilian in the organization, responsible for multiple aspects of management direction for the research, design, development, construction, testing, operation, and maintenance of over 170 operating naval nuclear propulsion plants and eight DOE naval reactor prototype plants.

From 1963 to 1979, Mr. Vaughan held various technical management positions within the Naval Nuclear Propulsion Program involving radiological controls, fuel materials development and testing, reactor plant mechanical components, and the Light Water Breeder Reactor.

Mr. Vaughan received a B.S. degree in electrical engineering from Duke University in 1957. From 1957 to 1959 he attended graduate level programs in nuclear reactor engineering at George Washington University and the University of Maryland. From 1957 to 1963 he served in the U. S. Navy.

Mr. Vaughan is a charter member of the Senior Executive Service. He was the recipient of a Meritorious Senior Executive Presidential Rank Award in 1980, and a Distinguished Senior Executive Presidential Rank Award in 1983. He also received a Meritorious Service Award for service with the DOE in 1979.

Mr. Vaughan is a native of Durham, North Carolina, and has resided in northern Virginia since 1957. He is married to the former Frances Smith. They have two children; Kevin, who attends Duke University, and Keith, who attends West Potomac High School.

NOTE: Mr. Vaughan is currently also serving as Acting Assistant Secretary for Nuclear Energy in addition to his assignment as Principal Deputy Assistant Secretary for Nuclear Energy This additional assignment was effective September 1, 1984.

January 1986

BIOGRAPHICAL SKETCH

JOHN R. LONGENECKER

John R. Longenecker is the Deputy Assistant Secretary for Uranium Enrichment, Office of Nuclear Energy, U.S. Department of Energy (DOE). In this position Mr. Longenecker is responsible for overall management and execution of the Uranium Enrichment Program including gaseous diffusion, atomic vapor laser isotope separation, and enrichment business operations.

The position involves the direction and administration of Government programs that provide uranium enrichment services to domestic and non-U.S. customers. Mr. Longenecker is responsible to the Assistant Secretary for Nuclear Energy for directing the operation of the Government enrichment facilities in Oak Ridge, Tennessee; Paducah, Kentucky; and Portsmouth, Ohio. He directs the development of advanced technologies for the enrichment of uranium.

Prior to this assignment, Mr. Longenecker served as Director of the Office of Breeder Demonstration Projects, where he was responsible for program management of the Clinch River Breeder Reactor Plant (CRBRP) Project, licensing of breeder demonstration projects, and conceptual design of the Liquid Metal Fast Breeder Reactor (LMFBR) Large Scale Prototype Breeder.

Previously, Mr. Longenecker served as Director, Plant Development Division; Chief, Conceptual Design Study Division of Reactor Research and Technology; Technical Assistant to the Program Director, Nuclear Energy of DOE; and in various capacities in the Energy Research and Development Administration's (ERDA) Division of Reactor Research and Development, including Special Assistant to the Director, Acting Assistant Project Director for Procurement for CRBRP, Acting Chief of the CRBRP Mechanical Components Branch, and Reactor Engineer for various LMFBR projects. He joined the Atomic Energy Commission in 1973 and served in the Division of Reactor Development and Technology prior to the formation of ERDA in 1975, and DOE in 1977.

Prior to entering Government service, Mr. Longenecker was employed by the Ford Motor Company as a research engineer and by the firm of John Robinson and Associates as a structural engineer.

Mr. Longenecker received both his B.S. and M.S. degrees in engineering mechanics from the Pennsylvania State University.

Mr. Longenecker was born in Port Royal, Pennsylvania, on July 27, 1949, and resides in Monrovia, Maryland with his wife Bonnie and daughter Laura.

February 1986

STATEMENT OF BEN C. RUSCHE

Mr. Chairman and Members of the Subcommittee:

I am pleased to appear before you today to present the FY 1987 budget for the U.S. Department of Energy's (DOE's) Office of Civilian Radioactive Waste Management. I will highlight the major activities planned for FY 1987 under the Nuclear Waste Fund program, as well as under the Civilian Radioactive Waste Research and Development program and provide a current status of implementation of and plans under the Nuclear Waste Policy Act of 1982 (NWPA). Since the NWPA requires the annual submission of a triennial budget under the Nuclear Waste Fund, in my discussion of the FY 1987 Nuclear Waste Fund program, I will include estimates for FY 1988 and FY 1989.

BUDGET OVERVIEW

The NWPA created the Nuclear Waste Fund which is financed by fees collected from owners and generators of spent nuclear fuel and high-level radioactive waste. The FY 1987 budget request for the Nuclear Waste Fund is $769.3 million, compared to $499.0 million for FY 1986. The Nuclear Waste Fund budget estimate for FY 1988 is $863.0 million and for FY 1989 is $799.2 million.

Research and development (R&D) activities not financed under the Nuclear Waste Fund are funded under the Energy Supply R&D appropriation in a program entitled Civilian Radioactive Waste R&D. The FY 1987 budget request for Civilian Radioactive Waste R&D is $6.5 million, compared to $16.0 million in FY 1986.

The FY 1986 budget request for budget authority funded by the Nuclear Waste Fund is summarized in Table 1. The FY 1987 Departmental budget request for Civilian Radioactive Waste R&D is summarized in Table 2. Under the Nuclear Waste Fund, the increased FY 1987 request will provide for extensive site characterization activities to begin exploratory shaft design and construction and to conduct intensive engineering tests and analyses to support the waste package and repository designs for the first repository. These activities will be conducted at each of the three candidate repository sites approved by the President for site characterization. DOE plans to formally recommend three sites for characterization to the President in Spring 1986.

The increase in FY 1987 will also provide for preparation for site field investigations in crystalline rock under consideration for a second repository and design of the second repository. While construction of a second repository is not authorized by Congress, other activities involving siting and design of a second repository are required under the NWPA.

In addition to an increase in the budget related to the repository activities, the FY 1987 budget request also represents a significant increase over FY 1986 in activities related to Monitored Retrievable Storage (MRS), should Congress adopt the proposal required by Section 141 of the NWPA. The FY 1987 request of $46 million compared to $3.0 million in FY 1986 supports Congressional approval to proceed with activities that are critical to the deployment of an MRS facility. In that proposal, DOE will recommend the construction of an MRS to receive, consolidate and package spent fuel for bulk shipment to a repository.

The program proposed to be funded from the Nuclear Waste Fund puts first priority on the first geologic repository and the associated transportation, integration and management systems. Second priority is given to MRS because of its potential for improving the overall system, followed by a third priority to the second repository siting activity. Neither the MRS nor the second repository is authorized for construction by the NWPA, but it is clear that the MRS offers the earliest and best means for assuring that the objectives of the NWPA are carried out.

TABLE 1

FY 1987 CONGRESSIONAL BUDGET
NUCLEAR WASTE FUND
($in Thousands)

	FY 1986 Approp. 3/	FY 1987 Request
NUCLEAR WASTE FUND		
Repository Development		
o First Repository	$386,050	$541,800
o Second Repository	35,500	78,700
Monitored Retrievable Storage	3,000	46,000
Transportation and Systems Integration	21,275	33,375
Program Management and Technical Support	53,212	69,474
TOTAL	499,037	769,349
Projected Receipts		
o One mill/KHh fee	378,600 1/	420,500 1/
o One-time fee	2,300	2,500
TOTAL	380,900	423,000
Interest Income	118,000 2/	115,000 2/
TOTAL	498,900 2/	538,000 2/
Staffing Full-Time Equivalents (FTE's)	292	292

1/ Based on projected gross nuclear electricity generation reduced by 5% to approximate net nuclear electricity generation as a result of the recent Wisconsin court decision. (Wisconsin Electric Power Company, et al vs Hodel, 83-1066,84-8571 (decided December 6, 1985)). At the time of this budget submission, net nuclear electricity generation projections were not available.

2/ Based on average yield of Treasury security portfolio.

3/ After Gramm-Rudman-Hollings adjustment.

TABLE 2

FY 1987 CONGRESSIONAL BUDGET
ENERGY SUPPLY RESEARCH AND DEVELOPMENT ACTIVITIES
($ in Thousands)

	FY 1986 Approp.	FY 1987 Request
CIVILIAN RADIOACTIVE WASTE R&D		
Spent Fuel Storage Development	$ 8,554	$ 6,300
Alternative Disposal Concepts	7,207	------
Program Direction	303	200
TOTAL	$ 16,064 a/	$ 6,500
Staffing FTE's	5	3

---

a/ Reflects a general reduction of $30,000; APD Reduction, and a reduction of $631,000 in compliance with the Gramm-Rudman-Hollings Deficit Reduction Act, PL 99-177.

An increase in Transportation and Systems Integration in FY 1987 is also requested. The FY 1987 request of $33.4 million compared to the FY 1986 appropriation of $21.3 million from the Nuclear Waste Fund represents an effort to be initiated during FY 1986 for the private sector to design, fabricate and test prototype casks for DOE to consider in developing transportation casks for shipping spent fuel from reactors directly to a repository or from reactor to an MRS.

The FY 1987 budget request under the Civilian Radioactive Waste R&D program of $6.5 million represents a decrease from the FY 1986 budget of $16.0 million. Essentially, this results from the fact that no funds are being requested for research and development concerning alternatives for permanent disposal of spent fuel and high-level waste. During FY 1986 and previous years, the principal alternative disposal concept funded has been subseabed disposal. Activities related to research and development in alternative disposal concepts called for in Section 222 of the NWPA are not proposed for funding after FY 1986.

NUCLEAR WASTE FUND PROGRAM

With the overview of the FY 1987 budget request in mind, I would like now to give a brief status of the program.

The NWPA calls for DOE to site, design, construct, operate and close the Nation's first geologic repository for spent fuel and high-level waste; to site and design a second repository; to submit a proposal to Congress on the need for and feasibility of Monitored Retrievable Storage facilities; to develop a transportation system and carry out certain other activities in support of the development of a disposal system. It established a method of disposal, a schedule, technical processes and a funding mechanism -- the Nuclear Waste Fund -- to ensure successful implementation of the NWPA.

Interwoven throughout these activities is the requirement for an extensive system of interactions providing checks and balances to ensure Federal accountability to the States, affected Indian Tribes, the public, the electric utilities, their ratepayers and the Congress. To ensure the accountability of the Federal Government -- specifically, DOE -- to the other parties and concerned citizens, we have on many occasions expanded the interactive process beyond that called for in the NWPA. We have been undertaking steps to ensure that the affected States and Indian Tribes can provide early input to DOE's decisionmaking processes. For example, we have invited affected States and Indian Tribes to participate in the Office of Civilian Radioactive Waste Management internal coordinating groups on socioeconomic and environmental issues.

In spite of these actions, DOE is often criticized by many of the affected parties for not providing the opportunity for "effective" participation. In passing the NWPA, Congress found that "State and public participation in the planning and development of repositories is essential in order to promote public confidence in the safety of disposal of such waste and spent fuel...." My reading of that finding is that not only does the Federal Government have to be accountable to the affected and interested parties in the Nation, but so do the other participants. An important part of the FY 1987 budget request is to fund participation by States and Indian Tribes.

I do not believe it is the intent of Congress to fund participation to thwart progress in developing a disposal system that will provide reasonable assurance that the public and the environment will be adequately protected from the hazards posed by high-level waste and spent fuel. Effective participation is, I believe, participation for the purpose of ensuring that the resulting decisions will adequately protect the public health, safety and environment.

Repositories

To date, DOE has identified nine potentially acceptable sites for the first repository, prepared draft Environmental Assessments which propose five of those sites as suitable for site characterization and propose three of the five sites for recommendation to the President for site characterization.

A lengthy review process was undertaken in which DOE reviewed approximately 23,000 comments received on the draft Environmental Assessments. Based on comments, we selected one of three ranking methodologies which have been identified in the draft EA's to be used as an aid in the decision process to formally recommend sites for characterization. At the suggestion of several commentors, last fall, we requested the National Academy of Sciences (NAS) Board on Radioactive Waste Management to conduct an independent review of the appropriateness of the ranking methodology -- referred to as the utility estimation method.

The NAS Board responded that the methodology, if properly applied, is appropriate, but further recommended that the application of the methodology be reviewed. Therefore, over the last several months, while DOE has been completing final Environmental Assessments to accompany the formal nomination of sites for characterization and applying the ranking methodology in the recommendation decision process, the NAS Board and DOE have met several times on this subject. We expect to have a final review session in late March.

We consider the review by the NAS Board to be quite valuable in ensuring us, as well as the public, that the decisions being made in the siting process are indeed scientifically and technically sound. Based on our discussions with the NAS Board, we currently expect to issue final Environmental Assessments and formally nominate and recommend sites for characterization this Spring, around the end of April. The formal nomination and recommendation will be based on siting guidelines (10 CFR 960), utilizing available geotechnical, environmental and other relevant information contained in the Environmental Assessments, and will be accompanied by Environmental Assessments and the comments provided by the NAS Board.

The FY 1987 budget request for first repository activities is $541.8 million compared to the FY 1986 appropriation of $386.0 million. This increase is primarily due to the site characterization activities which are planned to commence in FY 1987. The extensive site evaluation involved in site characterization includes construction of deep, exploratory shafts at the three sites approved for site characterization and in situ testing. DOE is planning two shafts at each site. Shaft construction at the three sites will take approximately two years with in situ tests scheduled to start in FY 1989.

The FY 1988 budget estimate for first repository activities is $632.4 million and the FY 1989 budget estimate is $571.5 million.

Major program milestones associated with the first repository are:

Milestones	Calendar Year
o Issue final environmental assessments	April 1986
o Nominate at least five sites and recommend three candidate sites to President for characterization	April 1986
o Issue initial Site Characterization Plans (SCP) for tuff and basalt candidate sites	December 1986
o Issue initial SCP for salt candidate site	May 1987
o Begin construction of first exploratory shaft	May 1987
o Issue Final Environmental Impact Statement	1991
o Recommend first repository site to President	1991
o Recommend first repository site to Congress	1991
o Submit construction application to NRC	1991
o Receive from NRC Construction Authorization	1993-1994
o Begin Phase I Operations	1998

As previously mentioned, the NWPA directs DOE to conduct site investigations for a second repository, although construction of the second repository is contingent upon future Congressional authorization. The process for selecting the second repository site is similar to the process for the first repository with decision points approximately seven to ten years later than those for the first repository.

For the second repository, DOE may consider sites identified as potentially acceptable but not nominated for the first repository, sites found potentially acceptable from rock formations not previously studied in the first repository selection process and sites characterized but not chosen for the first repository site.

Rock formations not previously studied in the first repository selection process have been crystalline rock. Following national surveys, DOE identified 235 crystalline rockbodies in 17 States in three regions -- the North Central, the Northeast and the Southeast parts of the country.

In the "regional phase" of investigation, DOE collected and assessed publicly available geologic and environmental data, reviewed these data with the States and prepared Regional Environmental and Geologic Characterization Reports for each of the three Regions. In addition, through workshops and other interactions with the crystalline States, DOE prepared a Region-to-Area Screening Methodology to be used for narrowing down the 235 rockbodies to a small number of areas preferred for further study.

On January 16, 1986, following application of the Screening Methodology to the data contained in the Regional Characterization Reports, we issued for public comment a Draft Area Recommendation Report (ARR). The Draft ARR proposes from among the 235 rockbodies in 17 States, 12 potentially acceptable sites in 7 States. The 7 States, listed in alphabetical order, are: Georgia, Maine, Minnesota, New Hampshire, North Carolina, Virginia and Wisconsin. The Draft ARR also identifies 8 other areas in the same 7 States as suitable for possible further consideration.

During the public comment period on the Draft ARR, DOE will hold more than 70 public briefings and public hearings in all 17

States. After review of the oral and written comments received on the Draft ARR, DOE will issue a final ARR, formally identify potentially acceptable sites in crystalline rock and begin the "area phase" activities for those areas determined potentially acceptable sites for the second repository. Area phase activities include on-site investigations to collect and assess geologic, environmental, socioeconomic and transportation data.

The FY 1987 budget request for second repository activities is $78.7 million compared to the FY 1986 budget appropriation of $35.5 million. The increase is principally to fund preparation for on-site area-phase work which is scheduled to begin in FY 1988 and take approximately three-to-five years. The FY 1988 estimate for second repository activities is $74.2 million and the FY 1989 estimate is $71.5 million.

The major milestones leading to the site recommendation for the second repository are as follows:

Milestones	Calendar Year
o Issue final Region-to-Area Screening Methodology	April 1985
o Issue final regional characterization reports	September 1985
o Issue draft Area Recommendation Report	January 1986
o Issue final Area Recommendation Report	Summer 1986
o Identify Potentially Acceptable Sites	Summer 1986
o Issue final Area Characterization Plan and initiate crystalline rock area phase field investigations	November 1987
o Nominate and recommend sites to President for characterization	1993
o Recommend second repository site to Congress	1999

Monitored Retrievable Storage

The NWPA (Section 141) directs DOE to complete a study of the need for and feasibility of an MRS, and to submit to the

Congress a proposal for the construction of one or more MRS facililties. The NWPA specifies that the proposal include a program for siting, development, construction and operation of an MRS facility; site specific designs and cost estimates for the construction of such a facility, should Congress approve its construction; a plan for funding the construction and operation of such a facility; and a plan for integrating such a facility into the overall Federal waste management system.

In spring of 1985, DOE completed its analysis of the need for and feasibility of an MRS facility and announced our conclusion that such a facility could serve as an integral and important part of the overall waste disposal system. Over the next few months, a proposal for an MRS facility was prepared; and in mid-December, a review draft of the proposal and supporting documents was sent to the Environmental Protection Agency and the Nuclear Regulatory Commission for comment as specified by the Act. Generally favorable comments have been received from both agencies.

DOE has been enjoined from making any proposal or filing any documents with the Congress which rely on the siting studies performed in conjunction with the proposal preparation process. We have appealed the injunction and are hopeful that we will receive a speedy resolution of the legal issues involved so that we can submit the proposal.

Because of the injunction, I am limited in the extent to which I can describe the elements of the proposal. However, I can give the following details:

In our proposal, we will recommend that Congress:

- Approve the construction of an MRS facility at a specific site;
- Limit the storage capacity at the MRS facility to 15,000 metric tons of spent fuel;

- Preclude waste acceptance by the MRS facility until a construction authorization for the first repository is received from the NRC;
- Direct DOE to implement measures responsive to the concerns and recommendations of the host State and local governments; and,
- Direct DOE to implement the program plan accompanying the proposal.

The proposal will be accompanied by NRC and EPA comments.

The proposal contains extensive and unique provisions with regard to State and local involvement in the MRS program. The most innovative and far-reaching element contained in the proposal is the establishment of an MRS Steering Committee to provide a formal mechanism to obtain State and local input, including recommendations and evaluations regarding the design, construction, operation and, eventually, the decommissioning of the MRS facility. This Committee, composed of State and local government representatives of their own choosing, as well as DOE and industry representatives, would provide guidance, conduct evaluations, and, if necessary, recommend corrective actions with regard to the MRS facility. We are proposing that the Committee's involvement extend to a number of areas -- environment, safety and health; transportation; public information; and financial matters.

In accordance with other provisions of the NWPA, should Congress approve proceeding with an MRS facility, we are committed to seeking immediately to enter into a formal Consultation and Cooperation Agreement with the host State.

The FY 1987 budget request supports proceeding with activities that are critical to deployment of an MRS facility. With this in mind, the FY 1987 request for MRS activities is $46 million compared to the FY 1986 budget appropriation of $3 million. These funds would be used primarily for site data collection and analysis, final design of the facility itself, regulatory compliance studies and State liaison activities. The schedule for construction of the MRS allows ten years from the time Congress approves our proceeding, to the start up of operations. The FY 1988 estimate is $50 million and the FY 1989 estimate is $53 million.

Nuclear Waste Fund

In April 1983, DOE adopted a fee of one mill (one-tenth of a cent) per kilowatt hour charged to utilities for all nuclear-generated electricity beginning April 7, 1983, as specified in the NWPA. Revenues collected from the on-going fee by DOE through December 31, 1985, total approximately $880 million.

In addition to spent fuel generated since April 7, 1983, spent fuel or high-level waste generated prior to that date is subject to a fee equivalent to an average charge of one mill per kilowatt hour. Utilities had until June 1985 to decide on one of three payment options. Those who chose to pay in one lump sum by June 1985, to save interest charges, made payments totalling more than $1.4 billion. This represents more than half of the one-time fee liability of $2.3 billion for civilian nuclear waste in existence prior to April 7, 1983. Following receipt of these monies, DOE reimbursed the U.S. Treasury approximately $265 million, the total amount owed on the appropriated debt transferred to the Nuclear Waste Fund upon enactment of the NWPA.

In April 1985, the President accepted DOE's recommendation to dispose of defense waste in a commercial repository. The Federal Government, therefore, will pay an equivalent fee to that paid by utilities. This use of the repository will generate additional revenue for the Fund. The amount of the additional revenue is presently being determined and, therefore, is not included in our revenue estimates. We are in the final stages of discussions with DOE's Office of Defense Programs to determine an equitable cost-sharing methodology.

The revenue projections based on the one mill per kilowatt hour fee are shown in Table 3.

TABLE 3

NUCLEAR WASTE FUND REVENUE PROJECTIONS
($ in millions)

FY 1983 (actual)	$ 73.6
FY 1984 (actual)	329.5
FY 1985 (actual):	
-One mil/KWh	367.3
-One-time fee	1,427.4
-Interest Earned	38.4
FY 1986	
-One mil/KWh	378.6 a/
-One-time fee	2.3
-Interest Earned	118.0 b/
FY 1987	
-One mil/KWh	420.5 a/
-One-time fee	2.5
-Interest Earned	115.0 b/
FY 1988	
-One mil/KWh	474.5 a/
-One-time fee	17.2
-Interest Earned	105.0 b/
FY 1989	
-One mil/KWh	508.6 a/
-One-time fee	17.5
-Interest Earned	99.0 b/

a/ Based on projected gross nuclear electricity generation reduced by 5% to approximate net nuclear electricity generation as a result of the recent Wisconsin court decision. (Wisconsin Electric Power Company, et al vs. Hodel, 83-1066,84-8571 (decided December 6, 1985)). At the time of this budget submission, net nuclear electricity generation projections were not available.

b/ Based on average yield of Treasury security portfolio.

Transportation and Systems Integration

The FY 1987 budget request for activities associated with Transportation and Systems Integration is $33.4 million. The FY 1988 estimate is $33.8 million; and the FY 1989 estimate is $31.0 million.

The funding request for FY 1987 provides for development of adequate transportation and integrated systems for the shipping and management of nuclear waste among the various components of the disposal system.

The FY 1987 major activities include funding for the private sector to design, fabricate and test prototype casks for truck, rail and barge transport based on competitive procurements. Work will be continued to support institutional programs, environmental and economic analysis and technology development, data systems and testing and engineering development and systems integration.

The FY 1988 and FY 1989 estimates of $33.8 million and $31.0 million, respectively, would fund the continuation of these efforts.

Program Management and Support

The FY 1987 budget request for program management and technical support is $69.5 million. The FY 1988 estimate is $72.7 million; and the FY 1989 estimate is $72.2 million.

The FY 1987 funding level of $69.5 million provides technical support for waste management activities including (a) technical support integration, (b) development of standard materials characterization methods by the Material Characterization Center, and (c) supporting studies including fund management activities.

This funding level provides for a sustained staffing level from FY 1986 to FY 1987 of 292 full-time equivalent positions at headquarters and in the Operations Offices for fund management, site investigation, technology development and institutional liaison associated with the technical management of the repository, MRS (if approved), supporting programs and the management of the Nuclear Waste Fund.

The FY 1988 and FY 1989 estimates of $72.7 million and $72.2 million, respectively, will provide for program management and technical support associated with site characterization activities at three candidate repository sites, intensified siting efforts in the second repository program, a vigorous MRS program and increasing efforts in transportation systems development. Major emphasis will continue on developing an integrated cost-effective waste disposal system providing full protection of public health and safety and the environment.

CIVILIAN RADIOACTIVE WASTE R&D PROGRAM

Development and demonstration activities under the Civilian Radioactive Waste R&D Program are funded from the General Fund rather than funds collected from the utilties and deposited into the Nuclear Waste Fund.

The FY 1987 budget request for the Civilian Radioactive Waste R&D activities is $6.5 million compared to $16.0 million in FY 1986.

I would like to briefly discuss the strategy and highlight the activities which we plan to undertake in FY 1987.

Strategy

DOE's Civilian Radioactive Waste R&D program efforts are to utilize all means directed or available through the Act or other authority to encourage and expedite the availability of licensed new at-reactor storage technologies. No funds are requested for research and development concerning alternative means and technologies for the permanent disposal of high-level radioactive wastes, including the subseabed disposal concept. Activities to implement Section 222 -- alternative means of disposal -- are not proposed after FY 1986.

Spent Fuel Storage R&D

DOE's spent fuel storage development program is intended to encourage and expedite the most efficient use of existing storage facilities and the addition of new, licensed capacity in a timely fashion. The FY 1987 budget request to support these activities is $6.3 million compared to $8.5 in FY 1986.

Activities in FY 1987 will include continued dry storage cask testing as part of a cooperative agreement with Virginia Power; completion of preliminary tests and analyses on a transportable cask as part of a cooperative agreement with Carolina Power and Light; and initiation of rod consolidation demonstrations of spent fuel as part of a cooperative agreement with Northeast Utilities Services Company. In addition, we plan to continue cooperative activities in information exchange regarding spent fuel storage and disposal with non-nuclear weapon states and to continue to participate in international activities with the International Atomic Energy Agency, the Nuclear Energy Agency and the Federal Republic of Germany.

We do not plan to continue investigations into alternative disposal concepts, including subseabed disposal, nor generic methods and support studies beyond those international information exchanges and international involvement discussed under spent fuel storage development.

Program Direction

The FY 1987 budget request for program direction is $.2 million. At this level, three full-time equivalents would be funded to manage the Civilian Radioactive Waste R&D programs. Included are administrative and technical personnel who manage a broad range of activities such as: research, development, demonstration, industrial involvement and international programs.

In summary, Mr. Chairman, the FY 1987 budget request for spending authority under the Nuclear Waste Fund and for appropriations under the Civilian Radioactive Waste R&D budget are designed to carry out an integrated waste managment program in an efficient and effective manner and to achieve the 1998 mandate of the Nuclear Waste Policy Act, that is, to have in place a comprehensive and functional waste disposal system to begin receiving spent fuel.

This concludes my written testimony.

Chairman HATFIELD. The Senator from Wisconsin?

Senator KASTEN. Mr. Chairman, thank you very much.

Mr. Rusche, as you know, Wisconsin has been targeted by the Department of Energy and you just noted it as one of your target States as a potential home for a nuclear waste site. I have serious objections to that, and I think I am speaking for people all across the State of Wisconsin, not just simply in the area which is being discussed.

I don't think the issue is where to build the second repository, but whether to build the second repository at that time. In that light, I have some questions that I would like to ask you to respond to.

First of all, do you agree with William Purcell, DOE's Director for the Office of Geological Repositories, that it is technically feasible to construct a western repository large enough to accommodate all of our Nation's nuclear waste for the next several decades?

Mr. RUSCHE. Indeed, I do, Senator. Based on information we have now, that is his statement. In fact, Mr. Purcell is here with me today.

Senator KASTEN. It would be technically feasible?

Mr. RUSCHE. Based on the information we have here today. Of course, we have not done exploration, but based on that information, we do believe that would be the case.

Senator KASTEN. I can appreciate the politics of all difficult situations and all decisions, and clearly, you are making some decisions that are difficult, but Gramm-Rudman forces us to dramatically reduce Federal Government spending.

Can you estimate how many billions of dollars would be saved by building one rather than two repositories?

Mr. RUSCHE. I don't have a number right at my fingertips, but I would be glad to provide that number to you. It is clearly detailed in the budget. I don't have it at my fingertips. It is substantial, however.

Senator KASTEN. A substantial number of dollars could be saved if we went to one and not two repositories?

Mr. RUSCHE. Several billion dollars, for sure. I would note, Senator, that the funds that are used for the execution of this program are funds that are provided by the utilities who own reactors and are, therefore, generating electricity, and therefore, these funds do not come from the general fund of the United States.

[The information follows:]

REPOSITORY COST SAVINGS

Preliminary estimates of the total system life cycle cost [TSLCC] of a single repository system capable of disposing of all commercial and defense waste projected to be produced through 2020, range from $17.2 billion to $27.1 billion. This compares with TSLCC estimates of a two-repository system of from $23.7 billion to $32.3 billion.

Senator KASTEN. The nuclear waste facilities may be guarded 24 hours a day to reduce the threat of sabotage and terrorist attacks, the use of raw materials, and the construction of nuclear weapons, et cetera. If so, wouldn't it be substantially safer and also less expensive to guard one and protect one facility rather than two facilities?

Mr. Rusche. I think on that point it would not be that much difference. If we can provide protection for one repository, we can provide it equally well for two. I don't believe that would be a major determining factor.

PUBLIC HEARING PROCESS

Senator Kasten. I have a question regarding a DOE ad. The Department of Energy's first public formal hearing in Wisconsin is going to be in White Lake, WI, on March 19. The Department of Energy ad on this hearing refers only to the crystalline repository project and nowhere mentions that this project is the nuclear waste siting project. I have it in front of me here. It says—Department of Energy public hearing, March 19, and it says: "To obtain recommendations and comments on the draft area recommendation report crystalline repository project."

There is no reference to the nuclear waste siting project, and a number of people in Wisconsin are confused, and frankly, the ones that know what is going on are angry by the fact that they look upon this as the Department of Energy trying to deemphasize what is really going on here.

We received calls from confused constituents, angry constituents in some cases, wondering why the word "nuclear," the word "waste," or the word "repository" was never used.

Is the Department of Energy trying to downplay the importance of these official hearings? Doesn't this effectively deny full participation, which is mandated by the Nuclear Waste Policy Act?

Mr. Rusche. Senator, I perhaps owe you an apology if that appears to be the impression of that ad, but I can't imagine that anybody in Wisconsin would be deceived by the ad and does not know what the area of recommendation report is. Members of your State have participated in hearings, in briefings over the last 3 years, and the crystalline repository project is a title that has been widely used. If it has produced that confusion, I apologize for it. I can assure you, we have no intention of either minimizing or being deceptive to people. In fact, I would have the impression that we are the most widely known offensive element in Wisconsin. [Laughter.]

Senator Kasten. Already. [Laughter.]

Mr. Rusche. Already.

Senator Kasten. I don't quarrel with you about the fact that this is creating great controversy, but a large number of people contacted our offices, particularly our office in central Wisconsin in Wausau, asking: "What are they trying to do here?" The word "nuclear" doesn't appear. The word "waste" doesn't appear anywhere in this ad, nor does the word "waste" or "repository." The average citizen, not the one that has been following this day to day, and there are many, may not know what is going on and as a result, may not attend. I am just pointing out to you that there is a feeling in Wisconsin that the advertising has been downplaying some of the real issues here.

I think that if the Government wants to place a nuclear waste repository in Wisconsin, then Wisconsin ought to have something to say about it. I note that is the purpose of the hearings, and I think what we want to do is to encourage active participation at the hearings.

Mr. RUSCHE. We will try not to add insult to injury, but I will assure that in every such ad, we make the comment you have suggested.

MEASURING GROUND WATER PROPERTIES

Senator KASTEN. I just have one further comment, Mr. Chairman.

Wisconsin, as you know, is situated on top of many of the country's critical watersheds. Not only do we have a large number of lakes in northern Wisconsin, as Minnesota and other States, but we also are situated on the Great Lakes; 95 percent of the fresh water of the entire world.

A radioactive leak finding its way into the Great Lakes or the Mississippi basin could impact on at least one-third of the Nation's drinking water supply. How accurate today are your field techniques to measure ground water properties?

Mr. RUSCHE. We believe they are entirely adequate when they are done, but that won't be done, as in the case of your State, for another 12 or 15 years. In the States we are now embarking upon to begin such measurements, we are obligated under the law to honor and meet the requirements of the Environmental Protection Agency and the Nuclear Regulatory Commission, whose objective is to assure that the very thing you are talking about does not occur. If we cannot, in the period between now and the time we select a site, determine convincingly and with great confidence that that is the case, then the site will not be a suitable site for consideration by the President in 1999.

I would like to assure you and the people of Wisconsin that that is an obligation that is both legal as well as technically accepted by the effort that we have underway.

Senator KASTEN. I have got a couple of other questions which I would like to submit to you for the record and just say that there is great concern, as I am sure you are aware, and we are going to be willing to work with you every single step of the way, particularly with regard to the ground water questions and the ability or the inability that you have to measure ground water properties.

Mr. RUSCHE. I appreciate your comments, and I would note that members of the State activity from your State have been very effective in working with us. In fact, one of your representatives was at a very important meeting we had yesterday in the Midwest and was a real contributor. I think again, it is important for your State as well as all States, for us to have the best data available and to do the best job that we can. When we do, I think the country's wastes will adequately be disposed of. We are committed to having that adequately happen.

Senator KASTEN. Thank you, Mr. Chairman.

Chairman HATFIELD. The Senator from New Mexico?

Senator DOMENICI. Thank you very much, Mr. Chairman.

I have some questions for Acting Secretary Vaughan, but while we are here with Director Rusche, I could start with him, if you please, Mr. Chairman.

First, Mr. Rusche, I think you look very, very good, considering what you have been through. Are you feeling all right. [Laughter.]

Mr. RUSCHE. My health seems to be in good shape, sir.

Senator DOMENICI. No effect from all this radioactivity that is going around the country?

Mr. RUSCHE. No; others say I must be wasting away. [Laughter.]

But so far, I have seen no effects of it.

Senator DOMENICI. Let me indicate to you that while I am concerned about the progress or the lack of progress in the high-level waste program, particularly as I have expressed in the authorizing committee with the consultation and cooperation agreements or lack thereof, I must compliment you; under your leadership, the Office of Civilian Radioactive Waste Management, as I see it, is making a sincere effort to work with the States, and I believe you are making a sincere effort to work with the Indian tribes. I understand the difficult job you have, and I compliment you for both of those.

Mr. RUSCHE. Thank you.

SUBSEABED DISPOSAL

Senator DOMENICI. With reference to alternative disposal means of high-level waste other than the deep geological disposal, you allude to a termination of the seabed alternative concept. In the 1987 budget, you have zero for it. Last year, I believe, what was it, $7 million?

Mr. RUSCHE. I believe it was about $8 million; yes, sir.

Senator DOMENICI. About $8 million. Could you just quickly tell us why you zeroed that out, and what other alternative concept we should pursue with reference to the NWPA?

Mr. RUSCHE. Senator, the act denies use of the Nuclear Waste Fund for generic research. We considered whether or not the subseabed work could be, by some means, funded under the Nuclear Waste Fund, and we thought we might find a rationale to consider it. We were led to this consideration, because heretofore, we haven't had funding under the general fund activity as generic research.

The fact is, when we looked at the budget stringencies for general fund appropriations, our priorities were such that there just was not money to do it.

What we have attempted to do so far is to change the direction of the program for this year and in the international community in which we are working, invite the members to bring the research to a point of consolidation so that in the future, if we desire to go back, we would have a valid place to start from. I think it is simply a matter of availability of funds. At the moment, we are looking at crystalline rock. We are looking at argillaceous rock in the United States. I think the institutional and political vehicle questions with respect to subseabed disposal, which had been deferred intentionally until some technical feasibility was established, are very major considerations.

Senator DOMENICI. Was there international collaboration in that seabed activity?

Mr. RUSCHE. Yes, indeed; over the last several years. In fact, we have provided about one-half the total funding.

Senator DOMENICI. If we go out, will that stop?

Mr. RUSCHE. I think the answer to that is unclear at the moment. We certainly are a major contributor. I think a number of countries have come to the same conclusion; that this is a good time to hold things together and let's see how the London Dumping Convention goes and get a better feel for the institutional matter and perhaps later on reinstitute that work.

LOW-LEVEL WASTE

Senator DOMENICI. I have two brief questions and then I will go to Secretary Vaughan.

In the Low Level Waste Act that we adopted last year, you were asked to make a study of low-level orphan waste and report back to Congress within a year. What is the status of the study? Is it proceeding?

Mr. RUSCHE. Mr. Vaughan and I both are involved in that study, as well as the principal program people. The study is beginning, and we hope to have a report before Congress before that time.

TIMING OF MRS PROPOSAL

Senator DOMENICI. My last question has to do with the injunction that you alluded to in Tennessee. Clearly, I don't intend in any way to ask you questions that would violate the injunction. I am not aware of its breadth or content, but when do you anticipate to receive a resolution so that you could proceed to submit the proposal to Congress?

Mr. RUSCHE. Senator, our attorneys suggest that the earliest we might receive such resolution might be by about the beginning of the summer. We have received a ruling granting an expedited procedure before the sixth circuit. I think that I am no better predictor than anybody else, but that is on hold for perhaps 3 or 4 months.

URANIUM ENRICHMENT BILATERAL TALKS

Senator DOMENICI. Mr. Vaughan, as you know, I am concerned with both uranium enrichment and uranium mining in the United States. I think we have reached a point where it is now concluded that we have no viable uranium mining industry in the United States. Even the Secretary had to make that finding.

As the President's trade ambassador contemplates and begins the bilateral negotiations with Canada for a treaty, I wonder if the Department has considered requesting that any specific activities take place in those bilateral discussions regarding Canadian uranium and its impact on the United States' capability to produce uranium domestically?

Mr. VAUGHAN. Senator, I would prefer to provide you a more detailed answer to that question for the record, since I don't have it at my fingertips, the precise considerations that the U.S. Trade Representative is considering for those talks. We are certainly mindful of the considerations which you raised.

As you well know, we have long considered Canada a very friendly trading partner, no oceans to cross, but I would like to have the appropriate people in the Department who are working on that subject assist me in providing you a detailed answer for the record.

Senator DOMENICI. Why don't I put the question this way: Would you provide to the committee, if it is the chairman's pleasure, at your earliest convenience, with a statement as to whether or not the Secretary of Energy has requested anything specific out of the bilateral talks regarding uranium, and if so, what? If not, why not?

Mr. VAUGHAN. We will be pleased to respond to that request.

Senator DOMENICI. I would thank you for doing that.

[The information follows:]

BILATERAL TALKS REGARDING URANIUM

We have discussed this matter with the Office of the U.S. Trade Representative. The trade declaration, which resulted from the 1985 meeting between Canadian Prime Minister Mulroney and President Reagan, included a specific commitment on energy trade between the two countries. Both leaders pledged to rely on market forces to the maximum degree regarding energy trade. In any trade talks with Canada, the United States will seek to affirm and strengthen this approach in our bilateral energy trade. In particular, the United States will seek an end to the Canadian uranium export restriction which requires conversion to uranium hexafluoride in Canada prior to export. We have taken the free and fair trade approach, and we expect the Canadians to do likewise.

URANIUM ENRICHMENT

Senator DOMENICI. Mr. Chairman, I have a series of questions for Mr. Vaughan regarding the Uranium Enrichment Program. I believe in the interest of time that I would submit them and ask him to respond. I believe he could answer them rather quickly for the record. So could I submit them and ask about the accounting processes that have gone on with the various estimates of what is owed to the Federal Government with reference to uranium, enrichment activity since the transfer over in 1970. If I give you a series of questions as far as the Department's dollar numbers, inventories, capital, could you reply in a reasonably short period of time?

Mr. VAUGHAN. I would expect we could supply that within no more than a few days and would be pleased to do that. If you want to take the time now, I would guess we could probably respond to a number of them now. I will defer to your judgment.

Chairman HATFIELD. I would be very happy to have the Senator extend his questioning if he wishes.

Senator DOMENICI. Why don't we. I can rest a little and then I will come back and ask about it in a little bit.

NUCLEAR SAFETY AND LICENSING

Chairman HATFIELD. Mr. Secretary, the budget proposal before us has an LWR Safety and Licensing Program listed, I believe, for the figure of about $11 million. What is the fiscal year 1986 figure for this program?

Mr. VAUGHAN. $12.5 million.

Chairman HATFIELD. $12.5 million. What is the timeframe that you anticipate for this program in terms of the duration and the total multiyear costs that you expect to acquire?

Mr. VAUGHAN. Mr. Chairman, that is a generic effort, which the Department has supported for a number of years. I would certainly expect, for the next 5 years, let's say, for that to be an approximately level funded effort.

The key activities in that program deal with some independent evaluation and analysis of risk-based licensing techniques, zero accident assessment, reliability of plants, the capability as to whether the plants that are now operating may be safe to extend beyond their 40-year lifetime, and a number of other generic-type safety and licensing support efforts, where we feel that the technical base is necessary to complement the institutional efforts that are underway to achieve a more rational licensing and regulation process in this country and the kind of benefits that could add to our emergency planning efforts.

I am sure you are aware that the Department has submitted licensing reform legislation which has been recently introduced in the Senate by Senator McClure—it was previously introduced in the House last year. While much of that is legislative, there is also a good deal of technical support needed to make it work. The NRC generally concentrates on particular, specific problems relating to the reactors being built or operating, whereas the Department of Energy historically more generic safety-related research. It dates back to the time of the Atomic Energy Act.

Chairman HATFIELD. But the LOFT portion of this program was completed in fiscal year 1986.

Mr. VAUGHAN. The LOFT portion, in terms of the testing efforts, was completed in 1986. In order to get use of the LOFT test results it is necessary to do postirradiation examination to translate those test results into some practical models and scenarios which can then be used for a severe accident assessment of risk-based licensing. Those activities will continue. And they are a part of that program that you cited.

We are continuing a supplemental international agreement, whereby other countries will participate with us in that effort.

Chairman HATFIELD. Could you break down that expenditure for the record?

Mr. VAUGHAN. Yes.

Chairman HATFIELD. What portion of that program is completed and what remains in terms of both the delineations that you have made and in terms of the LOFT portion, particularly?

Mr. VAUGHAN. I would be pleased to do that.

[The information follows:]

LOSS-OF-FLUID-TEST [LOFT] PROGRAM COSTS

The total funding for the eight experiments comprising the international LOFT project is set at $91.96 million in the international LOFT Project Agreement, as amended. Of this, the U.S. Government committed $70 million ($25 million from the

U.S. Nuclear Regulatory Commission and $45 million from the U.S. Department of Energy). These amounts were obligated in the fiscal year 1983 to fiscal year 1986 budgets, and no additional funds are needed to complete the agreement work scope.

In achieving the objective of the final experiment of this program, it was necessary to subject a fuel bundle to severe damage. It is believed that this fuel is representative of the condition of the TMI-2 core during its evolution toward its final condition, and that an examination of this LOFT fuel would provide important information in the interpretation of the TMI-2 accident as well as the areas of severe accident and source terms.

Therefore, the international consortium has agreed to extend the current agreement by including the examination of the LOFT bundle within the scope of the project. Cost of this additional work is estimated at $3.85 million, of which the U.S. portion is $1.28 million, to be provided at $640,000 per year in fiscal years 1987 and 1988. This will be made up in contributions from the NRC, DOE, and the Electric Power Research Institute. The DOE portion of this work will be funded as part of our generic efforts under the safety and licensing subelement of the LWR Program.

Chairman HATFIELD. You indicated a distinction between this program and that which is being conducted by the NRC which, according to my recollection, I think was established 10 or so years ago. It was charged with the licensing and the public safety. I am not quite sure I understand why, then, this program is necessary with that responsibility being assigned to the NRC by its generic legislation?

Mr. VAUGHAN. If you go back to specific legislation which is approximately 5 years old—and I can't recall the name of the particular public law, but I will supply that for the record—there was a clear delineation that both the Department of Energy, as the successor to the Atomic Energy Commission, as well as the NRC, had continuing and supplementary roles to play in safety-related activities. I am sure you are also aware that we need to do some safety-related activities for our own facilities, and I can also assure you that on a staff-to-staff basis as on a management basis, carefully work with the Nuclear Regulatory Commission, as well as with industry groups such as the Electric Power Research Institute, and others, to show that the work that is done is complementary and not duplicative.

[The information follows:]

DOE AND NRC ROLES IN NUCLEAR REACTOR SAFETY

The legislation that split responsibility for nuclear reactor safety research between DOE and NRC was section 103. (2) and (3) of Public Law 93-438, the Energy Reorganization Act of 1974.

Chairman HATFIELD. Would there be any possibility of EPRI or the reactor vendors carrying out this responsibility?

Mr. VAUGHAN. The EPRI organization, as well as other parts of industry, do a certain amount of R&D work in addition to that which we do.

For example, you may have heard of the acronym IDCOR, which relates to industry effort for associating core damage accidents, and that has been an effort funded through industry and others which is complementary to ours and NRC. So there is work going on by all parties.

Probably insufficient work would be done if all parties didn't participate. The participation by more than one party also is extremely healthy in this area to provide some independent, technical analysis review of the other party's work.

Chairman HATFIELD. We do have some additional questions for you, Mr. Secretary, which will be included at the end of the hearing.

Mr. VAUGHAN. We will be very pleased to promptly respond.

NRC REPORT ON HANFORD SITE

Chairman HATFIELD. Mr. Rusche, last year in the hearings, you recall, I made reference to the U.S. Geological Survey and the NRC's critical comments concerning DOE's site evaluation report of the Hanford waste site. Can you comment on what actions have been taken, if any, relating to the criticisms and concerns of these other Federal agencies?

Mr. RUSCHE. I do remember your questions and comments, and I would like to note that even at the time we were in the process of discussions with both of those bodies, and I believe it is fair to say that those particular questions have been addressed, and, I think, resolved.

I suspect that if we talk again today, we will find that there are other matters that continue to provide a diversity in the program. I believe, though, that we have made considerable progress, particularly with the ground water problems and ground water monitors, which were the subject of those questions last year, particularly from the survey. We have a good working relationship with the Commission, and it continues to improve. I believe it is fair to say that we have made great progress.

OREGON-WASHINGTON COOPERATION IN REVIEW OF HANFORD SITE

Chairman HATFIELD. Mr. Rusche, you also recall last year, perhaps, there was an expressed interest or concern by the Congress to incorporate the working relationships between Oregon and Washington on the potential impact of the Hanford site on the Columbia River. Can you give me a status report of this joint effort?

Mr. RUSCHE. Both as a result of your comment and other members of the delegation, we announced and stated we would be happy to receive their requests in concert with the State of Washington. The act, if you will recall, places specific direction on our interaction with affected States. By the direction of the act, Oregon is not a directly affected State. There is no question about the proximity and the relevance of the comments you made. I believe the State of Oregon and the State of Washington people have had several meetings. To the best of my knowledge, we have not yet had a joint funding request, but we are prepared to accept it and be responsive to it in a positive way.

Chairman HATFIELD. Do you have any additional information on that? Would you submit it for the record?

Mr. VAUGHAN. I would be glad to, Mr. Chairman.

[The information follows:]

HANFORD SITE

Under the Washington State grant, a contract has been signed by the States of Oregon and Washington, with DOE review and concurrence, to give Oregon $100,000 for fiscal year 1986 to fund a study related to the potential siting of a repository at Hanford.

Chairman HATFIELD. I am glad we are not hung up on technical definitions as it relates to the practical impact of some of these things.

Mr. RUSCHE. We can't escape the technical ones, but we have got to work with them, and I think this is a practical way to work.

Chairman HATFIELD. It always reminds me of 1964, I would say to my colleagues, there was a wind that came upon the Oregon coast and moved inward, inland, reaching, I think, 150 miles an hour in some areas with tremendous destruction. But the Weather Bureau does not have in its handbook of nomenclature a word such as a tornado or hurricane, because they don't happen on the west coast. Therefore, they have never been able to officially ever call it other than a windstorm. So, in spite of the fact that it was a hurricane, we have never gotten an official recognition because of the technical definitions and so forth.

Mr. RUSCHE. We have tried to go beyond that, sir, and I think in the case you are referring to, we are willing to work in the manner you suggested.

Chairman HATFIELD. Because it happened on Columbus Day, we call it the Columbus Day windstorm. [Laughter.]

Senator DOMENICI. The Italian windstorm. [Laughter.]

Chairman HATFIELD. I would like to again recognize the Senator from New Mexico, if he would like to pursue the question now with the witnesses.

URANIUM ENRICHMENT ENTERPRISE

Senator DOMENICI. I am very appreciative, Mr. Chairman.

Secretary Vaughan, I want to ask you a series of questions about the uranium enrichment criteria that are presently being contemplated. As I understand it, the notice of proposed rulemaking in 10 CFR on January 29, 1986, is published. I would like to ask some questions concerning the uranium enrichment activities as it precedes all of this to see if I can get in my mind some clarification of how we figured out the account.

So let me start. I hope it doesn't take too much of your time. I will try to be very careful and quick, because we are all going to run out of time here.

Mr. VAUGHAN. I think what I would like to do, Senator Domenici, is first of all, thank you for your keen interest and constructive comments regarding the uranium enrichment business over the years. We have appreciated that. I am going to ask Mr. Longenecker to help me respond to your questions crisply, because I suspect you will have some data in a number of areas.

Senator DOMENICI. Fine; let me start.

The first separate financial statement of uranium enrichment activities, as I understand it, was published in 1971. What was the initial opening balance for the government investment line item, including physical plant, preproduced inventory and working capital? Do you know what that number was?

Mr. LONGENECKER. It was about $1.5 billion, Senator. Of that amount, $1 billion of that was the estimated value of the gaseous diffusion plants and the other half billion was inventories and other assets transferred to us at that time.

Senator DOMENICI. How much of that investment had been for military purposes?

Mr. LONGENECKER. Essentially all of it. The gaseous diffusion plants were built in the fifties for military purposes and a significant portion of the inventory had been built for military purposes as well.

Senator DOMENICI. What was the initial value of the physical plant as transferred to the Uranium Enrichment Service on June 30, 1970, and the initial value for working capital in inventory?

Mr. LONGENECKER. The gaseous diffusion plants cost about $2 billion when they were built in the 1950's for military purposes. When we assumed ownership in 1969, it was an accounting assumption that the plants were about half depreciated. So we picked them up at a net book value of $1 billion.

Senator DOMENICI. Of the half billion dollars for working capital and inventory, did it also cover inventory for military use later?

Mr. LONGENECKER. The inventories that we accepted were in enriched uranium, and at that time our primary customer was the military. So, we used those as working inventories for both civilian and military customers.

RECOVERY OF GOVERNMENT COSTS

Senator DOMENICI. As I understand it, the administration is proposing to make repayment to the Treasury of what is called prior unrecovered Government costs.

How do you compute the amount, as far as your Department?

Mr. LONGENECKER. We computed the value from our annual financial statements for uranium enrichment. We started with the original $1.5 billion that was put on the books in 1969. We had increased that estimated asset value to about $7.5 billion by 1985 by investing in enriched uranium inventories, upgrades to the gaseous diffusion plants, and in construction of the GCEP project.

However, by the end of 1985, we recognized that GCEP would never be operated and had no value in the market, wasn't usable. Also, a large portion of the three gaseous diffusion plants were not going to be usable in the future as enrichment assets and had no value in the market.

We arrived at the real asset value for uranium enrichment today of about $3.5 billion.

Senator DOMENICI. I assume that OMB calculates this in a different way and reaches a different amount. You don't have to tell me what it is. Is that a fair statement?

Mr. LONGENECKER. I believe we and OMB are in agreement that the net value of our assets are $3.5 billion.

Senator DOMENICI. All right. What portion of the prior unrecovered Government costs consist of uranium and what portion SWU?

Mr. LONGENECKER. Of the $3.5 billion, about $2.1 billion is inventories. Of the $2.1 billion, approximately $1.7 billion is separative work and about $400 million is natural uranium.

Senator DOMENICI. What is the net asset of uranium enrichment activities today?

Mr. LONGENECKER. Our total assets are worth $3.5 billion, and of that $3.5 billion, $2.1 billion consists of separative work and natural uranium.

Senator DOMENICI. Do you set the price of SWU on the basis of recovery of Government costs on an annual basis on a 10-year project basis?

Mr. LONGENECKER. On a 10-year projected basis. Under the Atomic Energy Act, we are required to recover costs over a reasonable period of time, which we now define that as 10 years.

Senator DOMENICI. Did the domestic customers, as you view it, understand that by signing the contracts with DOE, they would have to pay additional Government costs at a future date?

Mr. LONGENECKER. Senator, we issued the utilities services contract in January 1984, and we didn't articulate our policy on making the $3.5 billion payments to Treasury until January 1986. This policy is discussed in our proposed rulemaking and customers will have an opportunity to comment on it. But, the simple answer is "No." We announced the repayment policy about 2 years after the utilities services contracts were issued.

Senator DOMENICI. I thank you. I understand it.

Did DOE use program revenues to offset operating expenses in R&D and to expand the production capacity?

Mr. LONGENECKER. Yes.

Senator DOMENICI. DOE claims that the civilian program has received, if I understand correctly, $788 million in net appropriations.

Mr. LONGENECKER. That is our calculation for civilian purposes from 1969 through 1984 for the net cash flow, not appropriations.

Senator DOMENICI. OMB claims the amount is $6.7 billion, and the GAO thinks it is $7.5 billion; is that correct?

Mr. LONGENECKER. Those were actually calculations of our total asset value rather than the net cash flow that we have received.

Senator DOMENICI. So do you conclude that you are in agreement with GAO and OMB at this point?

Mr. LONGENECKER. I would hesitate to speak for GAO, but the administration's position is that the net value of our assets is $3.5 billion. That derives from the $7.5 million estimate minus the value of GCEP and the unused portion of gaseous diffusion plants. I believe that we and OMB are in agreement that the net cash flow was about $780 million for civilian purposes through the years.

Senator DOMENICI. The utilities maintain that the civilian programs have received only $350 million in cash outlays from Treasury. If the same pricing mechanism used today had applied in the past for military programs, do you agree that the net cash flow contribution from the Treasury to the civilian program since 1969 is about $350 million?

Mr. LONGENECKER. That is probably a reasonable estimate. I understand, since they have testified to that estimate twice recently, that the $350 million number is based on an historical accounting of military costs based on today's standards. As you are aware, before 1983, the military didn't budget for their enriched uranium. Therefore, doing that calculation involves 15 years of past accounting. In fact, in 1986 we changed our accounting procedures and allocation of costs to be sure that costs are adequately spread between the military and civilian.

But taking a look at the calculation that they have presented to other committees and looking at our pricing formula today, I would have to agree that $350 million is probably a reasonable estimate of cash flow to the civilian program.

Senator DOMENICI. I thank you very much.

Thank you, Mr. Chairman.

Chairman HATFIELD. Thank you, Senator.

ADDITIONAL PREPARED QUESTIONS FOR THE RECORD

Gentlemen, there will be, as I indicated earlier, some prepared questions submitted to you. I appreciate your cooperation and the rest of your testimony.

Mr. VAUGHAN. Thank you very much, Mr. Chairman.

[The questions and answers follow:]

QUESTIONS SUBMITTED BY CHAIRMAN HATFIELD

Light Water Reactors

Question: As I recall, Congress provided $4.75 million in FY 86 which was available to be matched on a 50% cost-shared basis with industry. What is the request in FY 87 for this program? (It appears to be $18 million).

Answer: The request for FY 1987 for the Advanced Light Water Reactor program is $18 million. Approximately $15 million of this budget request is required to continue the cost-shared tasks started in the last part of FY 1986.

Question: Do you propose a cost-shared program in FY 87? What level of cost-sharing?

Answer: Yes. Approximately $15 million of the FY 1987 support will be at least 50 percent cost-shared with industry. The remainder of the FY 1987 $18 million support is associated with supporting work performed in our laboratories.

We are transmitting to the Committee today a report on the Advanced Light Water Reactor Program which clarifies the relationship of the Department's program with industry-sponsored efforts and reflects a mutual interest to conduct a complementary program. The report outlines how we plan to secure a reasonable level of cost sharing on efforts that have commercial applications 5-10 years in the future. These planned programs satisfy recommendations by the Energy Research Advisory Board and are conducted within the cooperative umbrella agreement with the Electric Power Research Institute.

Question: What is the total cost of this multi-year program? What is the duration?

Answer: Cost-shared technology tasks totaling approximately $45 million over 3 years have been selected by the Department and will be initiated in late FY 1986. The total ALWR program is estimated to involve DOE funding of approximately $18 million per year for 5 years.

Question: How many reactor designs will be reviewed? When will you limit the number of designs or select one design?

Answer: The reactor designs are being developed by industry; DOE is providing supporting technology to help assure safety and licensability of the designs. At present, industry is pursuing three large ALWR's and three mid-sized ALWR's.

Question: How does this program complement the EPRI (Electric Power Research Institute - utilities research arm) program?

Answer: The EPRI Advanced Light Water Reactor program involves the cooperative effort of utilities, suppliers, architect-engineers and the Federal Government with innovative features to improve passive safety and operability. DOE and EPRI have executed a specific agreement on the Advanced Light Water Reactor program that provides for an allocation of work by EPRI and by DOE. A senior level DOE-EPRI management oversight group meets periodically to assure that the combined resources of both groups are used to maximum advantage. DOE's contribution to this cooperative program is to perform technology tasks on innovative features that offer opportunities for improving safety and reliability while preserving the competitive economics of nuclear power.

Question: What is the total cost and duration of the EPRI program on advanced LWR's?

Answer: The cooperative EPRI/Industry/Government program on advanced light water reactors builds on the extensive programs already underway by the major reactor vendors. The utility industry (through EPRI) focuses on developing a set of model requirements for next generation LWR's and on development of conceptual designs for small reactors. Direct utility funding for this effort is estimated to be about $20 million over the next 5 years. Vendor cost sharing is substantial, not including the hundreds of millions of dollars spent on engineering and testing of components for the advanced light water reactors.

Question: Your budget material mentions that this federal effort will help development requirements for future LWR's that "U.S. vendors have been developing for sale both here and abroad." Who are these vendors? Will there be any financial contribution or cost-sharing from these vendors? What level?

Answer: Reactor vendors such as General Electric and Westinghouse are developing ALWR's for sale both here and abroad. The vendors have developed ALWR designs at a cost of about $500 million. Direct EPRI and vendor cost sharing in connection with the DOE supported R&D effort will be at least $45 million over the next 3 years.

Question: The Department proposes an LWR Safety and Licensing program in FY 1987 to be funded at the $11 million level. What level of funding was proposed for this effort in FY 1986?

Answer: In FY 1986, the funding level for the Safety and Licensing activity was $13 million.

Question: What is the duration and total multi-year cost of this effort?

Answer: The R&D tasks under this light water reactor safety and licensing activity will require funding at roughly $11 million per year over the next 5 years.

Question: It appears that there are 3 major components to the program: severe accident technology, risk-based licensing, and a cooperative effort on productivity. Please provide the Committee with a breakdown for each major activity with funding levels for FY 85, 86, and 87.

Answer: The activities in this element are interrelated, and generally emphasize R&D to permit advances in safety technology for light water reactors. The topical areas of application of R&D

results are severe accident technology, regulatory reform support including risk-based licensing and improved productivity.

The funding breakdown is shown below:

Program Activity	Fiscal Year 1985	1986	1987
Severe Accident Technology	20.0	10.0	4.5
Regulatory Reform	0.4	0.2*	3.0
Improved Productivity	0.15	0.5*	3.5

*Funds in FY 1986 were covered under generic non-LWR activities.

Question: What is the level of cost-sharing or cooperation on the program to extend productivity? List the studies to be sponsored by the DOE with funding levels for FY 87.

Answer: The level of cost-sharing or cooperation by industry on the DOE program to extend productivity is approximately $10-15 million, depending on final sponsor budgets for FY 1987.

The major FY 1987 studies to be sponsored by DOE (with DOE's contribution at $3.5 M) are:

- Techniques to improve predictions of equipment performance
- Development of approved ASME code cases used to establish equipment operability
- Procedures and technologies to be used to requality components and structures for longer life
- Thermal annealing with embrittled reactor vessel or cast austenitic-ferritic stainless steels (to extend life of key components)
- Reference radiation damage data on low energy neutrons (to determine that long term damage effects are acceptable)

Question: How much will be available under you 87 budget for intervention in large construction projects or other interaction with regulators at the state and federal level?

Answer: That portion of the regulatory reform tasks related to a broad spectrum of federal, state, and other institutional activities is $2 million. No money is set aside for intervention in large construction projects.

Advanced Reactor R&D

Question: For the record, please provide the Committee with a breakdown of this program including the categories of HTGR, LMR, Breeder technology, fuel cycle technology, and RERTR funding levels for FY 85, 86 and 87.

Answer: The Advanced Reactor R&D program funding for FY 1987 as reflected in the FY 1986 structure includes the categories of HTGR, LMR, Breeder technology, Fuel Cycle technology, and RERTR. However, it should be noted that LMR contains $51.2M of facilities funding for

FY 1987, $26.9M for FY 1986, and $35.8M for FY 1985. (The information follows:)

NUCLEAR ENERGY RESEARCH AND DEVELOPMENT
FY 1987 PRESIDENT'S BUDGET IN FY 1986 STRUCTURE
(Dollars in thousands)

		FY 1986		
	FY 85	Appropriation	Adjusted Appropriation*	FY 87 Pres. Req.
Advanced Converter Reactor Technology				
Advanced HTGR	31,770	32,000	30,550	5,300
Liquid Metal Reactor (LMR)**	75,450	71,200	64,900	76,100
Subtotal	107,220	103,200	95,450	81,400
Advanced Breeder Reactor Technology				
Breeder Component Technology	14,000	6,700	6,447	0
Fuel Performance & Supply	36,970	24,900	23,189	7,500
Reactor Core Technology	9,165	7,220	6,947	6,800
Test Facilities	91,873	104,480	99,599	64,000
Nuclear Fuel Cycle	12,798	16,500	15,876	1,500
Subtotal	164,806	159,800	152,058	79,800
Civilian Reactor Development Program Support				
Reactor Develop Research Supt	9,693	2,625	2,526	3,500
Safeguards and Security	6,200	6,650	5,749	6,600
RERTR	4,692	5,200	5,003	0
Program Direction	7,335	7,400	6,892	7,700
Subtotal	27,920	21,875	20,170	17,800
GRAND TOTAL	299,946	284,875	267,678	179,000

* Adjusted for Gramm-Rudman-Hollings, general reductions, etc.
**FY 1985 - Facilities $35.8M
FY 1986 - Facilities $26.9M
FY 1987 - Facilities $51.2M

Question: Your budget material indicates that FY 1987 will be a transition period "during which military needs will be identified, certain technological activities will be phased out, and the R&D emphasis will be shifted . . . ." What activities will be phased out?

Answer: A number of design activities will be slowed down and therefore postponed until future years, including the preparation of detailed design description documentation, the conduct of detailed cost analyses, and the completion of trade-off studies on certain components. The Large Scale Prototype Breeder (LSPB) design work will be put on "hold." In the technology area, a number of supporting R&D tasks and features tests that would improve the knowledge base for concept evaluation decisions for both LMR and HTGR designs will not be conducted in FY 1987. In particular, for the LMR, tasks such as under-sodium viewing, code development to enable assessment of system reliability, long-life fuel design support, sodium fire experiments, high temperature materials development and pipe seismic response testing will be curtailed.

In the HTGR program, all technology activities, except fuel development, will be curtailed or deferred. Structural metallic materials development programs for both the steam cycle and advanced modular HTGR concepts will be phased out. The graphite development work will be reduced to a level necessary to support the DOE/JAERI cooperation. The sustained fuel development activities will be limited to those required to conduct the international cooperative program with Japan and the Federal Republic of Germany.

Question: In which specific areas do you anticipate greater international cooperation and cost sharing?

Answer: We anticipate greater international cooperation and cost sharing in elements of the Advanced Light Water Reactor, High Temperature Gas Reactor, and Liquid Metal Reactor Programs. In the Advanced Light Water Reactor program, there is international cooperation in plant concept development as well as extended core life, safety, plant life and advanced instrumentation and control. Much of the cooperation in the LWR area is conducted under private sector funding and arrangements.

Activity in both the High Temperature Gas and Liquid Metal Reactor programs include cooperation in concept development, research and development, and plant operations and improvement.

Those activities specifically funded under the Department's Advanced Reactor Development program include U.S. participation in foreign international plant designs--HTGR in Europe and LMR in Japan. Additionally, there are cost shared programs in fuel fabrication, irradiation and recycle; irradiations of core structural materials, core physics testing, seismic testing, operator training, plant dose reduction, analytical code development in safety and fuel performance, and in-service inspection devices. Because these programs are mutually advantageous, we expect them to continue and to expand at a pace determined by the common needs of the individual nations' programs.

High Temperature Gas Reactor (HTGR)

Question: What activities are reduced or curtailed in FY 1987 as compared to FY 1986?

Answer: Conceptual design activities will be continued, but at a lower level. Activities will focus on further defining passive safety characteristics, including the natural circulation reactor cavity cooling system and defining the conceptual design of the advanced circulator with magnetic bearings. Design activities and evaluations in other areas of the plant will be limited and focused to provide the basis for a preliminary cost estimate. Technology development activities will be focused on fuel performance testing to support the international cooperative programs with the Federal

Republic of Germany and Japan. Technology development activities will be curtailed in the areas of fission product transport, graphite and metals development, and advanced HTGR support for very high temperature process heat applications.

Question: Explain the extent of international participation in this program.

Answer: Cooperation with Japan was initiated in September 1985, with the signing of the "Implementing Agreement between DOE and JAERI on Cooperation in Research and Development in the Area of HTGR's." One cooperative program is underway for the testing of two Japanese fission chambers in the Fort St. Vrain reactor during the last half of FY 1987. Another major cooperative program, which is currently in the final approval phase, involves the joint testing of U.S. and Japanese HTGR fuel rods in the High Flux Isotope Reactor at ORNL under normal and accident conditions to assess their fission product retention capabilities. In addition to these activities, continuing efforts will be devoted to the development of a cooperative program in the area of graphite properties characterization.

The ongoing cooperation with the Federal Republic of Germany (FRG) and Switzerland (CH) will be limited to an exchange of results from U.S. and FRG fuel irradiation tests. The current cooperative activities in the areas of graphite and metals development will need to be adjusted as well. These cooperative efforts are covered by the "US/FRG/CH Umbrella Agreement for Cooperation in Gas-Cooled Reactor Development," which will reach the end of the 10-year term in February 1987.

Liquid Metal Reactor (LMR)

Question: Since the justification material contains very little information, for the record, provide a breakdown of all LMR activities with funding levels for FY 84, 85, 86, and 87.

Answer: A breakdown of all LMR activities with funding levels for FY 1984, 1985, 1986, and 1987 is as shown in the following table. The LMR funding data for FY 1984 is not provided because the program was specifically oriented toward supporting Breeder technology during that fiscal year.

(The information follows:)

(Dollars in thousands)

	FY 1985	FY 1986	FY 1987
Liquid Metal Reactor			
Advanced Concepts	14,000	19,730	9,300
Power Conversion	5,500	6,735	3,080
Nuclear Systems Tech.	20,150	11,547	12,520
Facilities	35,800	26,888	51,200
Subtotal	75,450	64,900	76,100

Question: Provide a breakdown by lab or vendor of all LMR activities in FY 85, FY 86, and FY 87.

Answer: A breakdown by lab or vendor of all LMR activities in FY 1985, FY 1986, and FY 1987 is as shown in the following table. It should be noted that LMR activities include funding for test facilities operations and maintenance at the Argonne National Laboratory, Energy Technology Engineering Center, and Hanford Engineering Development Laboratory.

	(Dollars in thousands)		
	FY 1985	FY 1986	FY 1987
Liquid Metal Reactors			
Argonne National Lab.	25,700	15,152	26,362
Hanford Engineering Dev. Lab.	17,490	14,275	28,804
Oak Ridge National Lab.	5,790	3,738	1,800
Los Alamos National Lab.	660	259	0
Energy Tech. Engineering Center	2,700	3,486	5,914
Rockwell International	8,265	6,834	4,500
General Electric	9,005	10,489	4,100
Westinghouse	2,060	1,340	1,000
Idaho Nuclear Eng. Lab.	0	1,404	0
Sandia National Lab.	0	184	0
Babcock & Wilcox	0	191	0
Pacific Northwest Lab.	0	1,073	0
Combustion Engineering	0	0	300
Burns & Roe	115	115	300
Bechtel	165	151	0
Other	3,500	6,209	3,020
TOTAL	75,450	64,900	76,100

Question: How much is requested in FY 1987 as compared to FY 1985 and FY 1986 for the advanced concept development effort? Explain the process used to implement the program.

Answer: Two LMR concept design contracts were selected following competitive bidding in the LMR advanced concept development program. These were for the Power Reactor Inherently Safe Module (PRISM) by General Electric and the Sodium Advanced Fast Reactor (SAFR) by Rockwell International.

These contracts provided for a three-phase design program, with DOE having the right to proceed or cancel between Phases I and II, and Phases II and III. Each phase covered a calendar year. Actual Phase I and Phase II costs are shown below along with the FY 1987 Phase III request:

Original Contract Budget

	CY	Total	GE	RI
Phase I	1985	14.6	8.4	6.2
Phase II	1986	13.9	8.8	5.1
Phase III	1987	6.0	3.0	3.0

The Phase III costs reflect a $550 thousand Gramm-Rudman-Hollings reduction.

The contractors, GE and RI, have responsibility for concept development and design decisions. In addition, these vendors are contributing approximately $900,000 of private funds to support commercialization of their designs. DOE monitors contract progress and assesses the design potential for meeting cost and safety goals through a series of technical assessments and an annual design review. Contract option renewal decisions are based on these DOE assessments. The national laboratories are conducting supporting R&D, code development, and testing needed to verify specific features of the advanced plants and their major components. Activities are also underway at universities to evaluate advanced instrumentation and controls, advanced computer systems, and automated systems for reactor operations and maintenance.

Question: Describe in detail the amount and nature of cost sharing by vendors participating in the advanced concept effort.

Answer: Both vendors participating in the advanced LMR concept effort are providing private funds to conduct studies specific to the commercialization of their designs. These commercialization efforts include interactions with utilities to obtain comments and to identify conditions that must exist for each concept to be accepted as a competitor in the energy marketplace. The General Electric cost share contribution (for the PRISM concept) is $500 thousand per fiscal year, including overhead and general and administrative costs. The Rockwell International cost share contribution (for the SAFR concept) is $400 thousand per fiscal year, (on the same basis). In addition, both vendors are working under a no fee arrangement.

Question: How much is included for LMR activities at test facilities in FY 1984, FY 1985, FY 1986, and FY 1987? (Lab by lab breakdown)

Answer: The funding for LMR activities, which includes technology R&D and facilities operation and maintenance costs, are reflected in the following table. It should be noted that FY 84 funding data is not included because the program was primarily oriented toward supporting Breeder Reactor Technology during that fiscal year.

LMR Activities
($ in Millions)

	FY 1985	FY 1986	FY 1987
HEDL	$17.5	$14.3	$28.8
ANL	$25.7	$15.2	$26.4
ETEC	$ 2.7	$ 3.5	$ 5.9

Three Mile Island Research and Development

Question: What is the current status of the TMI cleanup efforts?

Answer: All of the accident-related waste has been processed and the resultant waste concentrated and shipped to DOE laboratories.

The reactor head and plenum have been removed and reactor defueling was initiated in October 1985. To date approximately 20,000 lbs. of core debris has been placed in canisters and transferred to the spent fuel storage pool. The process of defueling has been slowed pending solution of a reduced visibility problem caused by the growth of micro-organisms inside the vessel.

Question: Please give the Committee an update on the severity of the accident particularly the melted fuel situation which has received some publicity.

Answer: The DOE research program has been under way for about 6 years. However, DOE has only had access to the core region since late 1983. At that time, DOE acoustically mapped the upper voided region of the core and obtained samples from the debris bed presently located on top of the degraded core.

Since that time, further work has provided many indications of the severity of core damage, including current observations that (1) approximately 30 percent of the upper core region is now a void (see attached figure), (2) a continuum of materials exist in the reactor vessel that were exposed to a wide range of temperatures, including previously molten fuel, and (3) as much as 20 percent of the core may have relocated to the bottom of the reactor vessel.

A very preliminary estimate based on sparse data was made that a substantial amount of the total material in the core may have become liquid during the course of the accident, such as stainless steel and other materials. However, the amount of fuel that melted is expected to be relatively small. A definitive statement regarding the amount of fuel that melted during the TMI-2 accident will have to await the completion of the DOE TMI-2 core examination program.

Question: What is the status of and timetable for the proposed transportation of the damaged core to INEL?

Answer: Equipment for the loading of casks at TMI has been procured by GPUN and is under test. All preparations for receipt of the core have been completed at INEL. Shipments are expected to begin in June 1986 and last approximately 2 years.

Question: What type of cask will be used and when will certification from NRC be received?

Answer: Two new double-containment rail cases designed and constructed by Nuclear Packaging will be utilized.

Each cask will transport seven canisters of core debris. It is our understanding that all issues relative to certification have been resolved and that NRC certification is expected by the end of March 1986.

Question: With regard to cleanup at TMI and the federal R&D effort, what is the current estimate of total costs for R&D and for cleanup?

Answer: The federal R&D effort has an estimated total cost of approximately $187 million. GPU's estimate for total cleanup cost is $985 million.

Question: What is the current funding status of the project?

Answer: Approximately $167 million of federal R&D funding will be applied by the end of FY 1986. The FY 1987 budget request contains $12 million for TMI funding. Federal R&D funding is planned to be completed in FY 1988.

Question: Is the federal role still limited to research and development?

Answer: Yes. The federal role is still to perform R&D to enhance plant safety and regulation and to develop technology for recovery from a serious accident.

Question: How much is GPU obligated to reimburse DOE at this time? In total?

Answer: GPUN is obligated to reimburse DOE for non-research activities, primarily associated with waste disposal. Presently identified reimbursements from GPUN total approximately $9.4 million. It is possible that this total may increase by $1-3 million as the total scope of reimbursable waste management activities is identified.

Question: Has there been any reimbursement for those non-research activities? When is reimbursement expected?

Answer: Approximately $2 million in GPU payments have been made to date, primarily associated with EPICOR disposal and abnormal waste disposal. $7.4 million in reimbursement will be made as the core debris is shipped to INEL. An additional $1-3 million will be paid as costs are incurred for further abnormal waste disposal activities.

Reduced Enrichment Research and Test Reactors (RERTR)

Question: How much has been spent on this program in the past?

Answer: To date, approximately $28 million has been spent on the Reduced Enrichment Research and Test Reactors (RERTR) Program.

Question: Explain the purpose and benefits of this program. Why should we use LEU in research reactors?

Answer: The program is designed to develop alternate fuel systems (for research and test reactors) that will provide the basis for converting reactors from highly enriched uranium (HEU) to low enriched uranium (LEU) and thus reduce the international traffic in HEU. This reduced traffic should have a corresponding reduction in potential proliferation threats associated with this weapons-capable material. LEU fuel, that is fuel containing uranium enriched to less than 20 percent U-235, is not a weapons grade material. Program results to date indicate LEU fuels can be used without significantly altering the performance or testing parameters of essentially all of these reactors.

Question: What is being accomplished in FY 86?

Answer: Testing is continuing on the fuel system that is planned as replacement fuel that would allow conversion of the full range of research and test reactors, including the higher power reactors that require the larger quantities of highly enriched uranium (HEU). This fuel system is the low enriched uranium (LEU)-silicide system. This testing is being carried out through in-core irradiation of test specimens, or mini-plates, prototype test elements, and a full-core demonstration involving more than 100 fuel elements that will take place over a period of 2 years. This latter activity, the full-core demonstration, is the principal activity ongoing in the program. The full-core demonstration began in January 1986 in the Oak Ridge Research Reactor and is planned to continue through calendar year 1987. Completion of analysis of performance information, both physics and fuels performance, will be carried out in parallel with and following the completion of the full-core demonstration. The program also provides for analytical support to reactor operators in analyzing changes or options to the reactor to allow conversion to take place. Support is also provided to the executive branch (State, NRC, DOD) in the evaluation of requests for export of HEU of U.S. origin pending availability of LEU replacement fuel.

Question: Are there technical obstacles for using LEU or converting to LEU in foreign and domestic research reactors?

Answer: We believe the technology being developed for the lower density (5.0 g/cc) silicide fuels will provide a sufficient base for conversion of essentially all these reactors except those very few that because of their very high power levels or unique test requirements cannot be converted except by using higher density (7.0 g/cc) silicide fuel. To provide a qualified replacement fuel for the higher-powered reactors, completion of ongoing test programs of the higher density silicide fuel will be required including analysis of results. These technical efforts, that will be based on mini-plate and element tests, are expected to be completed in the FY 1989 time frame when the RERTR program will be completed.

Space and Defense Power

Question: For the record, provide a breakdown for each activity within both low power systems and multimegawatt power systems with funding levels for FY 85, 86, and 87.

Answer: Overall funding has increased in both the low power and multimegawatt power programs. The actual amounts are shown in the following table.

Nuclear Energy Research & Development
Space & Defense Power Systems
($ in millions)

Low Power Systems	FY 1985 Appropriation	FY 1986 Appropriation	FY 1987 Request
SP-100 Ground Engineering Systems	8.8	16.0	30.0
Small Nuclear Power Source Demonstration Project	0.0	2.4	2.0
Dynamic Isotope Power System	0.0	0.0	13.0
Subtotal	8.8	18.4	45.0
Multimegawatt (MMW) Power Systems			
MMW Space Power System	0.0	1.8	23.7
MMW Terrestrial Powerplant Project	0.0	0.0	3.0
Subtotal	0.0	1.8	26.7
Total	8.8	20.2	71.7

Question: For MMW space power systems, provide a breakdown of all funding both DOE and DOD for all activities in FY 85, 86 and 87.

Answer: Program funding for the multimegawatt power system has increased. The funding for each Fiscal Year is contained is as follows:

Nuclear Energy Research & Development
Multimegawatt (MMW) Power System
($ in Millions)

	FY 85	FY 86	FY 87
DOE	0.0	1.8	23.7
DOD	1.6	14.0	22.5

Facilities

Question: For the record, provide a breakdown of the facilities activities at all facilities with funding levels and FTE's for FY 1985, FY 1986, and FY 1987. Explain any increases or decreases in FY 1987 from FY 1986.

Answer: The nuclear energy program's major facilities, which are funded under the facilities element of the budget, are located at the Hanford Engineering Development Laboratory (HEDL), Argonne National Laboratory (ANL)-West, and Energy Technology Engineering

Center (ETEC) sites. The facilities located at these sites and the principal activities are as follows:

- HEDL

  Fast Flux Test Facility - irradiation of prototypical sized fuels and materials; inherent safety testing to determine reactivity feedback contributions to passive safe shutdown margins for mixed-oxide fuel including those for reactor loss-of-flow without scram; feasibility demonstration of producing Cobalt 60 and Gadolinium 153 isotopes for medical uses; irradiation of candidate fuel for the defense SP-100 program; fabrication and irradiation of fuel and blanket test assemblies for joint program with the Power Reactor and Nuclear Fuel Development Corporation (PNC) of Japan; test demonstration of a 3-year long-life mixed oxide core; irradiation of international fusion program material specimens; and verification of operational reliability of mixed oxide reactor and core systems of Liquid Metal Reactors (LMR's).

  Fuels and materials Examination Facility and Secure Automated Fabrication (SAF) Line - highly automated fabrication of mixed oxide fuel; assembly of fuel pins and fuel assemblies; and storage of NE plutonium inventory.

  300 area - fabrication of the international fusion program materials open test article; fuel and blanket test assemblies under the joint DOE program with PNC of Japan; and fabrication of the long-life mixed oxide fuel.

- ANL-West

  Experimental Breeder Reactor-II - irradiation of both advanced converter and defense reactor (SP-100) fuels and materials in a fast flux sodium environment to determine their performance; irradiation of breached oxide fuel under joint program with Japan, to determine its behavior under normal and off-normal operating conditions and its effect on the reactor primary system; irradiation of metal fuels to demonstrate their behavior and burnup limit; inherent safety testing to determine reactivity feedback contributions to passive safe shutdown margins for reactors, including tests for loss-of-flow, loss-of-heat-sink and control rod withdrawal, all without scram; and verification of operational reliability of reactor and core systems of LMR's with plant lifetime exceeding 22 years.

  Zero Power Plutonium Reactor - critical measurements to check the accuracy of methods of calculations used by reactor designers and to verify core designs.

  Transient Reactor Test Facility - testing of reactor fuels under conditions simulating various types of extreme off-normal conditions in order to determine fuel performance, reliability and safety margins.

  Hot Fuel Examination Facility - assembly, disassembly, and examination of fuels and materials irradiated in the FFTF, EBR-II, and TREAT.

- ETEC

  Sodium Components Test Facility - performance and endurance testing of sodium steam generators and heat exchangers.

  Thermal Transient Facility - non-sodium, thermal, seismic, and mechanical stress testing of piping systems, fittings, and components to failure.

  Other Facilities - testing small components, instruments and small models of components and systems at prototypic conditions in support of advanced reactor designs.

The budgets and average staffing for these sites for FY 1985, FY 1986 and FY 1987 are indicated in the following table.

Facilities Budget and Staffing Levels
($ in Millions)

	FY 1985		FY 1986		FY 1987	
	$	Average Staffing	$	Average Staffing	$	Average Staffing
HEDL	$67.5	890	$63.3	810	$67.1	835
ANL-West	$44.5	690	$51.5	700	$44.3	660
ETEC	$19.7	335	$11.6	155	$9.1	103

The differences indicated between the FY 1986 and FY 1987 budgets and average staffing levels are a consequence of improvements in operational efficiencies, and other program related changes as follows:

- HEDL-The FY 1987 facilities budget element includes SAF funding reflecting completion of equipment installation in FY 1986 and the transition to integrated system checkout. In FY 1986, SAF funding of $9.5 million was provided under other breeder program budget elements. Estimated average FY 1986 staffing for SAF was approximately 100 people, bringing FY 1986 staffing for Facilities and SAF line to approximately 910.

- ANL-West-The decrease in funding between FY 1987 and FY 1986 for facilities activities primarily reflects a stretchout in the metal fuels development and demonstration testing program.

- ETEC-The decrease between FY 1987 and FY 1986 primarily results from completion of steam generator installation during FY 1986, and deferral of the majority of steam generator testing.

Question: Explain in more detail your proposed cost-sharing approach for key facilities. What level of cost-sharing is anticipated?

Answer: The proposed cost sharing approach discussed in our budget submission is being developed as part of a facilities optimization study that is currently underway. The facilities are managed as integrated units that conduct required tests in support of the defense, space, and civilian power programs for the DOE and other users. The Department is reviewing the current system of assessing user fees with the goal of developing appropriate, alternative approaches. Because the Department has not completed this review, it is premature to estimate how much money any revised method might yield. However, because implementation of any revised method would be initiated sometime in FY 1987, the incremental yield is anticipated to be small. Full application of any revised method would occur in FY 1988.

Question: How much non-DOE work is anticipated at the key facilities in FY 1986 and FY 1987?

Answer: In FY 1986, HEDL will receive approximately $15 million for performance of non-DOE work; ANL-West will receive approximately $3 million; and ETEC approximately $1.3 million. Current estimates for FY 1987 indicate that for non-DOE work, HEDL will receive approximately $15 million, ANL-West approximately $4 million, and ETEC approximately $3 million. These FY 1987 estimates could change slightly depending upon the results of our facilities optimization study which is in progress.

Program Direction

Question: Explain the need for an increase in program direction in FY 87 in view of the reduced program level for nuclear R&D.

Answer: Although the requested FY 1987 program funding level for the Nuclear Energy R&D decision unit is reduced, the program direction funding reflects a slight increase over the originally planned FY 1986 obligation. We are nearing the lower limit of personnel required to manage a viable R&D program and, as such, have increased the workload on our remaining staff. To alleviate additional disruptions and to avoid the high cost of layoff, we have attempted to achieve personnel reductions through attrition, rather than through reduction-in-force procedures. Although effective, this method is not predictable during a given period of time. Therefore, the FY 1987 funding provides some contingency, with minimum escalation, in the event that retirements and other attritions do not occur in the specific fiscal year being planned.

Question: Provide funding levels and FTE's requested and consumed for FY 85, 86, and 87.

Answer: The following table provides the requested data for the Nuclear Energy R&D decision unit.

	FY 1985	FY 1986	FY 1987
Total Program Funding			
Appropriation/Request	$412,612,000	$375,684,000	$330,900,000
Actual/Planned Obligations*	$441,537,000	$380,664,000	$330,900,000
Program Direction Funding			
Appropriation/Request	$8,385,000	$8,080,000	$9,550,000
Actual/Planned Obligations*	$9,674,000	$9,302,000	$9,550,000
FTE's			
Allocation/Request	148	126	119
Actual	157	131	

*Actual/Planned Obligations reflect the use of unobligated prior year balances.

Remedial Action

Question: Specifically, how does the Department plan to use the large increase requested in the Uranium mill tailings program? Provide a list of sites with allocated funding in FY 84, 85, 86 and 87.

Answer: Early in FY 1985, a review of the Uranium Mill Tailings Remedial Action (UMTRA) Project cost and schedule projections indicated a low probability of completing remedial action by March 1990 (when current authorization expires), and that the 1990 date could not be met cost-effectively.

To complete the UMTRA Project within the currently authorized 7-year period, appropriations of approximately $180M would be required for FY 1987, $250M for FY 1988, and $200M for FY 1989. These amounts would be disproportionately high in tight budget times and would cut too deeply into funds available for R&D. Thus, our requested funds are less than previously projected.

The increases in costs are based on actual project experience with both processing sites and vicinity properties. They reflect higher than anticipated costs in meeting the requirements of the EPA standards-- particularly in satisfying ground water requirements--and the need to relocate tailings to new disposal sites.

In consideration of the high annual funding requirements and the large number of sites and vicinity properties which would have to be under construction simultaneously during these peak years, the Department is proposing legislation to extend the authorization period to the end of FY 1993.

In the report accompanying the FY 1986 Energy and Water Development Appropriations Act, specific guidance was provided to assure remedial actions were carried out as planned at Salt Lake City, Shiprock, Canonsburg, and Lakeview. In a colloquy on the floor between Senator Hatfield and Senator Simpson, the intent of Congress to maintain planned schedules at Riverton was affirmed.

Specific accomplishments planned for FY 1987 include:

- Canonsburg, Pennsylvania: Continue site surveillance and maintenance.
- Shiprock, New Mexico: Complete remedial action. Initiate surveillance and maintenance.
- Salt Lake City, Utah: Complete processing site remedial action and vicinity property remedial action. Initiate surveillance and maintenance.
- Durango, Colorado: Complete 25 percent of processing site remedial action and 70 percent of vicinity property remedial action.
- Gunnison, Colorado: Complete design engineering and initiate processing site remedial action.
- Grand Junction, Colorado: Initiate and complete 5 percent of processing site remedial action. Initiate remedial action at approximately 800 vicinity properties.
- Rifle, Colorado: Complete the Remedial Action Plan, conceptual design, environmental documentation, and design engineering. Initiate vicinity properties engineering.
- Riverton, Wyoming: Complete design engineering and initiate processing site remedial action.
- Tuba City, Arizona: Complete vicinity property remedial action and 20 percent of processing site remedial action.
- Ambrosia Lake, New Mexico; Mexican Hat, Utah: Initiate processing site remedial action.
- Lakeview, Oregon: Complete 85 percent of processing site remedial action and complete work on 6 vicinity properties.
- Naturita, Colorado; Falls City, Texas; Green River, Utah; Slick Rock, Colorado; Belfield/Bowman, North Dakota; Maybell, Colorado; Complete the Remedial Action Plan, conceptual design, and environmental documentation. Initiate design engineering.
- Lowman, Idaho; Spook, Wyoming: Continue work on environmental documentation and initiate design engineering.
- Complete the survey of 3,450 vicinity properties, thus completing this work at all sites except Grand Junction, CO.

A list of sites with allocated funding for the requested fiscal years follows:

URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

SITE COST ESTIMATES
(Federal Share in millions of dollars)

STATE	SITE (priority)	TEC	FY 84	FY 85	FY 86	FY 87
Arizona	Monument Valley*(L)	$ 16.1	$ 0	$ 1.1	$ 0.9	$ 0.2
	Tuba City *(M)	18.4	0.2	1.6	2.0	4.2
Colorado	Durango (H)	52.6	1.8	3.2	2.4	14.5
	Grand Junction (H)	277.8	3.4	8.4	19.0	43.6
	Gunnison (H)	32.1	0.9	1.4	1.5	4.4
	Maybell (L)	21.7	0	0.5	1.0	1.5
	Naturita (M)	18.7	0	1.0	2.3	2.1
	Rifle (2)(H)	57.9	0.2	1.5	1.8	2.0
	Slick Rock (2) (L)	21.2	0	0.6	0.3	0.7
Idaho	Lowman (L)	11.8	0	0.4	0.7	1.8
New Mexico	Ambrosia Lake (M)	24.5	0	1.2	1.7	3.2
	Shiprock *(H)	23.8	1.9	2.8	10.9	3.8
North Dakota	Belfield (L)	9.2	0	0.3	0.8	0.9
	Bowman (L)	9.2	0	0.4	0.7	0.9
Oregon	Lakeview (M)	20.4	0.6	1.6	5.4	8.5
Pennsylvania	Canonsburg (H)	43.5	10.4	11.4	3.4	0.2
South Dakota	Edgemont **(H)	4.5	1.4	0.7	2.1	0
Texas	Falls City (M)	33.7	0	0.6	2.8	1.2
	Green River (L)	20.0	0	0.6	1.1	1.9
Utah	Mexican Hat *(M)	30.7	0.2	1.3	1.8	3.5
	Salt Lake City (H)	89.1	5.6	17.8	27.8	22.3
Wyoming	Spook (L)	10.2	0	0.3	0.7	1.7
	Riverton (H)	34.3	1.2	2.0	0.3	2.9
Total		$881.4	$27.8	$60.7	$91.4	$ 126.0

*Processing site on tribal lands owned by the Navajo Nation.

**Vicinity property remedial action only.
L:Low; M:Medium; H:High

Question: Please provide a list of activities to be funded in the FUSRAP program in FY 85, FY 86, and FY 87.

Answer: The attached Table 1 provides a list of activities and funding for FUSRAP.

Table 1

FUSRAP Activities and Funding

Site/Activity	(BA in Millions) Funding FY 1985	FY 1986	FY 1987
Albany Center, OR			
o Complete design engineering and initiate remedial action	$	$	$ 0.8
Niagara Falls Storage Site, NY			
o Complete design engineering for all vicinity properties and remedial action for all but four	5.7		
o Complete remedial action on remaining four vicinity properties and complete installation of cap on interim storage site		2.8	
o Complete final report of remedial action			0.3
Middlesex Landfill, NJ			
o Continue remedial action; complete excavation of 15,000 cubic yards of contaminated soil	0.9		
o Complete all remedial action		2.0	
o Complete final report of remedial action			0.2
Middlesex Sampling Plant, NJ			
o Provide surveillance and maintenance	0.2	0.2	0.2
o Start preliminary engineering		0.3	0.4
National Guard Armory, IL			
o Complete characterization, design engineering and remedial action			0.9
Palos Park, IL			
c Provide surveillance	0.1	0.1	0.1
Ventron, MA			
o Complete characterization			0.7

Table 1 - continued

FUSRAP Activities and Funding

	(BA in Millions)		
		Funding	
Site/Activity	FY 1985	FY 1986	FY 1987
St. Louis Airport Storage Site (Vicinity Properties), MO			
o Start Coldwater Creek characterization		0.2	
o Complete characterization			0.1
Wayne/Pequannock, NJ			
o Complete bus yard and ball field cleanup; start stabilization of onsite buried waste; provide surveillance and maintenance	1.8*		
o Complete cleanup of residential properties and 50% of Sheffield Brook; start Pompton River characterization; provide surveillance and maintenance		3.2	
o Complete Sheffield Brook cleanup to Pompton River; complete characterization in Pompton River area; provide surveillance and maintenance			3.4
Maywood, NJ			
o Complete cleanup of all designated vicinity properties; start Ballod property cleanup. Provide surveillance and maintenance	3.2**		
o Complete characterization of DOE storage storage site, Lodi commercial and Scanel properties; complete cleanup of Ballod property south of railroad spur; complete preliminary engineering evaluation of stabilization and disposal options; provide surveillance and maintenance		1.9	
o Complete characterization of Sears, Lodi residential and Route 17 properties; complete remedial action on Scanel, north of Ballod, and railroad spur properties			6.4

Table 1 - continued

FUSRAP Activities and Funding

Site/Activity	FY 1985	(BA in Millions) Funding FY 1986	FY 1987
Colonie, NY			
o Complete cleanup of 24 vicinity properties; begin hazardous chemical disposal; provide surveillance and maintenance	1.2		
o Complete cleanup of additional 10 vicinity properties; complete hazardous chemical disposal; complete preliminary engineering evaluation of stabilization and disposal options; provide surveillance and maintenance		1.4	
o Complete design engineering and remedial action for remaining vicinity properties (10 now designated with additions anticipated); start characterization of DOE property; provide surveillance and maintenance			2.7
Hazelwood, MO			
o Complete Latty Avenue ditch cleanup; provide surveillance and maintenance	0.6		
o Start onsite characterization of Latty Avenue site; provide surveillance and maintenance		0.6	
o Complete site characterization; provide surveillance and maintenance			1.0
St. Louis Airport Site, MO			
o Perform emergency erosion repairs on creek bank	0.5		
o Start site characterization and preliminary engineering		1.2	
o Complete site characterization and preliminary engineering			2.2
New Jersey Disposal Site			
o Complete large and small area survey; select sites and initiate drilling		0.1	1.0

Table 1 - continued

FUSRAP Activities and Funding

	(BA in Millions)		
		Funding	
Site/Activity	FY 1985	FY 1986	FY 1987
New York Disposal Site			
o Start and complete large area planning; begin small area screening			0.6
Subtotal	14.2	14.0	21.0
Technology and Systems Studies	0.3	0.0	0.0
General Project Support Activities	2.0	2.1	2.3
Capital Equipment	0.2	0.2	0.2
General Program Support Activities	2.4	2.7	2.1
Total SFMP	19.1* **	19.0	25.6

Includes contributions from:

*	W. R. Grace	0.8
**	Stepan	0.5
		1.3

Question: For surplus facilities program, include a table showing planned activities with funding levels in FY 85, FY 86 and FY 87.

Answer: The attached Table 2 provides the activities and associated funding by fiscal year for the surplus facilities program.

Table 2

Surplus Facilities Program

Project Planned Activities	(BA in Thousands) Funding FY 1985	FY 1986	FY 1987
Mound ANSPD Areas, OH			
o Continue D&D of PP Bldg. and removal of WTS line (72% complete)	$ 4,200	$	$
o Continue D&D of PP Bldg., continue WTS line and soil removal (83% complete)		4,340	
o Complete WTS line and soil removal, complete decontamination in PP Bldg. (94% complete)			4,360
TA2 Water Boiler Reactor, LANL, NM			
o Begin D&D, remove delay tanks and condensing line (10% complete)	155		
o Complete Phase I of D&D (20% complete)		125	
o No activities planned until 1990			0
UHTREX, LANL, NM			
o Begin planning and D&D activities (18% complete)			300
Surplus Facilities ANL-East, IL			
o Continue D&D of Bldgs. on East Area (63% complete)	800		
o Complete D&D of East Area (98% complete)		250	
o Complete project documentation and survey (100% complete)			0
EBWR, ANL, IL			
o Start EBWR planning and preparation		540	
o Continue D&D and complete planning (6% complete)			850
SPERT and BORAX Ancillaries, INEL, ID			
o Complete D&D of SPERT-1 reactor bldg. and BORAX-V pond	160		
o Complete final report for SPERT-1		25	
BORAX-V Facility, INEL, ID			
o Complete Phase I ground level cleanout	110		

Table 2 - continued

Surplus Facilities Program

Project Planned Activities	FY 1985	(BA in Thousands) Funding FY 1986	FY 1987
o Continue D&D of facility (15% complete)		200	
o Continue D&D of facility, complete D&D of turbine (36% complete)			250
Power Burst Facility, INEL, ID			
o Begin Phase I inactivation and fuel removal (10% complete)			6,000
Monticello Vicinity Properties, UT			
o Complete 15 additional remedial actions (47% complete)	470		
o Complete 7 additional remedial actions (62% complete)		500	
o Complete 12 additional remedial actions (87% complete)			600
Monticello Mill Site, UT			
o Complete draft EA and continue planning	680		
o Issue final EA and preliminary engineering design (12% complete)		1,000	
o Complete final engineering design and start cleanup (20% complete)			2,800
Molten Salt Reactor Experiment, ORNL, TN			
o Prepare technical plan for fuel disposition	100		
o Continue technical analysis of fuel storage upgrade		100	
o Complete preparation and study for fuel storage upgrade			50
Niagara Falls Storage Site, NY			
o Continue D&D, complete transfer of K-65 residues to Bldg. 411	1,725		
o Issue Final EIS, complete placement of interim cap		1,045	
o Complete interim action and issue final report			0

Table 2 - continued

Surplus Facilities Program

Project Planned Activities	FY 1985	FY 1986	FY 1987
	(BA in Thousands) Funding		
Weldon Spring Site, MO			
o Complete Quarry Characterization and continue planning	1,600		
o Issue draft EIS, award Project Management contract, continue planning		5,045	
o Initiate D&D action at Quarry, complete final EIS, begin water treatment			13,440
CEER Mayaquez, PR			
o Issue RFP, select D&D contractor, initiate D&D		400	
o Complete D&D of facility			1,435
Shippingport Station, PA			
o Complete Phase I, begin physical D&D	15,615		
o Complete site preparation and asbestos removal, continue D&D		22,595	
o Continue D&D, begin RPV/NST preparation			21,890
Nuclear Materials Development Facility, SFL, CA			
o Complete removal and packaging of gloveboxes	1,125		
o Complete rad waste shipments and physical D&D		1,365	
o Complete project report and survey			0
Disposal of Na, NaK, and LiH Waste, SSFL, CA			
o Complete disposal of free Na	140		
o Complete disposal of Na in cold traps and begin NaK disposal		140	
o Begin disposal of LiH (66% complete)			150

Table 2 - continued

Surplus Facilities Program

Project Planned Activities	(BA in Thousands) FY 1985	Funding FY 1986	FY 1987
Radioactive Material Development Facility, SSFL, CA			
o Complete D&D and report for ISF	100		
o Complete backfill of tank area		10	
o Decontaminate drain channels (66% complete)			50
SNAP-8 Facility, SSFL, CA			
o Initiate D&D activities and project planning			1,000
Subtotal	26,980	37,680	53,175
Surveillance and Maintenance	725	735	1,195
Program Administration	670	910	930
Technology Development, other	755	462	700
Capital Equipment	120	144	400
Total SFMP	29,250	39,931	56,400

West Valley

Question: Briefly provide the Committee with the current status of the West Valley Project.

Answer: The West Valley Demonstration Project (WVDP) is proceeding satisfactorily toward the beginning of vitrification of the high-level radioactive waste in FY 1989.

Nonradioactive testing of components of the Vitrification System are continuing as part of the functional checkout. Major construction activities associated with the Supernatant Treatment System (STS) are progressing well and bid packages for STS components are being evaluated. The STS will reduce the current volume of liquid wastes by some 90 percent, thereby reducing the ultimate amount of high-level solid waste requiring disposal in a deep geologic repository. The decontamination of cells to be used to house the Liquid Waste Treatment System (LWTS) is essentially complete and the LWTS bids are being evaluated. Radioactive operation of the Cement Solidification System (CSS) began and modifications to the CSS are being made to improve operability. The CSS will process low-level liquid wastes, thereby permitting low cost disposal by shallow burial. Zeolite mobilization tests have been completed and simulant sludge mobilization tests are underway in a one-sixth scale model. Decontamination of the Chemical Process Cell (CPC), which will be reused to store the vitrified high-level waste glass containers awaiting transportation to a Federal repository, is well underway. All major vessels have been removed from the CPC and vacuuming of the floor using a robot will begin shortly. Kerosene removal activities continue as the first of eight tanks which will be investigated has been uncovered.

In parallel with the activities of the WVDP, the spent nuclear fuel shipment program continues to return assemblies stored in the Fuel Receiving and Storage Pool (FRS) back to their utility owner. The FRS facility, when cleared of spent fuel assemblies, will be used for decontamination and disassembly of large plant components being removed from various shielded cells.

Question: Explain why there is a need for the increase in FY 1987.

Answer: The increase in funding is required to complete the procurement of equipment and systems and related construction for processing supernatant in the Supernatant Treatment System and for processing low-level waste in the Liquid Waste Treatment System. It will also provide for operation of both these systems beginning in mid-fiscal year.

The increase is also required for procurements necessary for conversion of the existing Component Test Stand into the Vitrification System which will be used to solidify the high-level radioactive waste beginning in FY 1989. Technical work on high-level waste vitrification will be increased to assure meeting the FY 1989 milestone.

Ongoing activities will continue in areas such as plant decontamination and decommissioning to support project efforts, site operations, and low-level and transuranic waste handling.

Question: How much is the total estimated cost for the project, how much is this over earlier estimates, and why has the cost increased?

Answer: The FY 1987 congressional data sheet has a Total Project Cost Estimate (TPCE) of $442 million for Phase I of the Project. Phase I does not include post-solidification costs of waste storage, transportation and final decontamination and decommissioning (Phase II). The previous congressional submission showed a TPCE of $473 million, so the current TPCE is approximately $30 million less than the earlier estimate.

General

Question: Please provide for the record a list of the top ten research and development contracts in the nuclear energy program including FY 1985 actuals, and FY 1986 and FY 1987 estimates of obligations for each contract. Please show only R&D funding, not maintenance and operating costs, and provide a brief description of the work being performed.

Answer: The top ten research and development contractors in the Nuclear Energy R&D Program, based on the average high amount of R&D funds allocated to the contractors, are as follows.

Facilities/Activities	R&D Funding (Dollars in Millions) FY 85	FY 86	FY 87
University of Chicago - Argonne National Laboratory	$ 36.5	$ 24.8	$ 22.7
The work performed includes: irradiation of advanced converter and defense reactor (SP-100) fuels and materials in a fast flux sodium environment; irradiation of breached oxide fuel under joint program with Japan; irradiation of metal fuels; inherent safety testing, including tests for loss-of-flow, loss-of-heat-sink and control rod withdrawal, and without scram; verification of operational reliability of reactor and core systems of LMR's with plant lifetime exceeding 22 years; critical measurements to check accuracy of design calculations and to verify core designs; testing of reactor fuels under conditions simulating extreme off-normal conditions; and assembly, disassembly, and examination of fuels and materials irradiated in the FFTF, EBR-II, and TREAT.			
EG&G-Idaho Nuclear Engineering Lab.	51.3	39.7	17.9
The work performed includes: removing and analyzing core debris from the TMI reactor vessel and primary system; conducting on-site support activities; performing off-site examination of damaged core; and conducting thermal hydraulic experiments related to design basis accidents and fission product aerosol and transport tests to resolve source term issues.			
Bettis	25.0	18.7	13.8
The work performed includes: defueling activities at the Shippingport Reactor associated with the LWBR program consisting of preparing and fuel for long-term storage, cleanup of facilities, and technical documentation; and core evaluation activities that consist of nondestructive assays of fuel rods to confirm breeding, documenting the technology for use by industry, and examining core and structural materials to determine the performance of the light water breeder reactor.			

Westinghouse Electric Corporation -HEDL	23.2	20.3	13.6
The work performed includes: irradiation of fuels and materials; inherent safety testing for mixed-oxide fuel, including those for reactor loss-of-flow without scram; feasibility demonstration of producing Cobalt 60 and Gadolinium 153 isotopes for medical uses; irradiation of fuel for SP-100; fabrication and irradiation of fuel and blanket test assemblies for joint program with Japan; demonstration of a 3-year long-life mixed oxide core; irradiation of International fusion program material specimens; and verification of Liquid Metal Reactors (LMR's); mixed oxide reactor and core systems; automated fabrication of mixed oxide fuel; assembly of fuel pins and fuel assemblies; and storage of NE plutonium inventory; fabrication of International fusion program materials open test article; fuel and blanket test assemblies under the joint DOE program with Japan; fabrication of the long-life mixed oxide fuel; and preparation for the SP-100 Ground Engineering test.			
General Electric	26.0	19.1	10.6
The work performed includes: activities associated with the design of the Power Reactor Inherently Safe Module (PRISM) concept; evaluating and testing advanced reactor cooling system components; predicting power performance of radioisotope thermoelectric generator (RTG); analyzing Galileo/Ulysses flight data; and developing modular RTG's for future NASA/DOD missions.			
Martin Marietta-ORNL	30.3	22.9	8.5
The work performed includes: fuel cycle limited integrated cold process testing and remote maintenance demonstration activities; testing High Temperature Gas Reactor (HTGR) fuels, graphite and high temperature materials; characterizing refractory alloys and developing product form materials fabrication processes for SP-100; assessing advanced shielding materials and cooling systems for the MMW space reactor; developing activities to improve heat source materials for RTG's and 9 Cr-1 Mo steel for reactors; and evaluating reactor shielding considerations of radiation penetration and streaming source.			

University of California Los Alamos National Lab.	9.9	9.9	7.1
The worked performed includes: safety and environmental compliance testing and analyses of RTG heat source fuels; developing fuels technology and demonstrating fuel pin fabrication for SP-100; assessing feasibility of MMW fuels; and conducting zero power tests for North Warning Project.			
Mound	6.2	3.6	5.0
The work performed includes: developing a preliminary terrestrial RTG heat source design; and assembling and testing of RTG's for space and terrestrial use.			
GA Technologies	18.0	14.6	4.5
The work performed includes: designing HTGR plant passive safety features, critical nuclear systems, and balance of plant components; testing the essential features of plant component; and conducting experiments under international cooperative agreements.			
Rockwell International	11.5	7.8	4.5
The work performed includes: activities associated with the design of the Sodium Advanced Fast Reactor (SAFR); modifying thermal hydraulic codes; and developing test articles in support of advanced concepts.			

Question: Discuss some of your efforts to reduce the costs of the enrichment enterprise.

Answer: The Department has made significant cost reductions in all enrichment program elements over the past three fiscal years. In 1985, the Oak Ridge Gaseous Diffusion Plant was placed in standby minimizing the cost of existing plant operations. This major near-term cost reduction decision followed extensive analysis showing that it would result in a savings of about $250 million between FY 1986 and FY 1991. Cost savings to date exceed original projections.

Also, we reduced the unit cost of production from the gaseous diffusion plants by taking advantage of the lowest-cost sources of power. As a result, gaseous diffusion power costs have decreased $16 per SWU in the past 2 years. Since 1985, the gaseous diffusion plants also made use of off-peak economy energy purchased on an as-available, economically attractive basis; such as, at night, on weekends, seasonally, and whenever lower-priced power opportunities are presented.

Another strategically necessary, but very difficult cost reduction decision was made to terminate the Gas Centrifuge Enrichment Plant, GCEP, project. After an extensive analysis of production costs and customer demand, DOE concluded that the completion of GCEP required the outlay of significant amounts of additional capital which was unjustifiable from an investment point of view. Savings from termination of the GCEP project are estimated at more than $4 billion as compared to the cost of completing the plant.

During 1985, an exhaustive, year-long assessment was made of the two technologies, Atomic Vapor Laser Isotope Separation, AVLIS, and the Advanced Gas Centrifuge,AGC, competing to become the uranium enrichment process of the future. Since the AVLIS process was shown to be superior to AGC, research and development for AGC was closed out. This decision is estimated to result in a $500 million cost avoidance.

Question: Provide a table which shows the level of demand charges paid to TVA and other power suppliers to date and for the duration of the contract period.

Answer: Consistent with the most recent operating plan, the capacity charges for power not purchased which the Department has paid or is projecting to pay in the future is shown in the following table. Fiscal Years 1987 through 1994 are in 1987 dollars and are based on the current operating plan. If projected military demands do not materialize, the TVA charges will be higher than shown in the table.

Capacity Charges for Power Not Purchased
($ Millions)

FY	TVA	EEInc	OVEC	Total
81	27	-	-	27
82	111	-	-	111
83	115	-	-	115
84	226	-	-	226
85	347	-	-	347
86	432	-	-	432
87	451	1	2	454
88	441	-	-	441
89	286	-	-	286
90	185	-	-	185
91	31	-	-	31
92	1	-	-	1
93	-	-	-	-
94	-	-	-	-

Question: When do you anticipate completion of GCEP termination?

Answer: The physical work involved in termination of the GCEP project is presently scheduled for June 1988.

Question: Why are you reducing sharply the funding for the new laser process or AVLIS?

Answer: A driving force in reducing the funding for the AVLIS program is deficit reduction. Additionally, the FY 1987 funding anticipates private sector participation. Such participation will be evaluated by the Department.

Question: Has there been any private sector interest expressed in AVLIS?

Answer: We have received no formal offers to invest in the deployment of AVLIS to date.

Question: When will you be able to determine whether there is any private sector interest in AVLIS?

Answer: On March 10, 1986, the Department announced the formation of a group to coordinate the divestiture of assets, including the AVLIS technology. This group is now working to determine the most appropriate means by which we can assess private sector interest in AVLIS technology.

Question: If there is no interest, will you continue federal development of AVLIS or terminate the effort?

Answer: The Administration has not decided what actions would be taken in the event that private sector interest does not materialize.

Question: Your budget proposes a payment to the Treasury of $235 million in FY 87. What would be the level of repayment for future years? How would the level of payments be determined?

Answer: The Department has determined that $3.5 billion is the total unrecovered Government investment in uranium enrichment that needs to be recovered. The Administration's FY 1987 budget proposed that $235 million of that investment be recovered and paid to the Treasury. For FY 1988 through FY 1991 the annual payments to Treasury, although estimated at about $270 million to $360 million per year, will be set in the annual budget process. Proposed annual payments will be determined based on the outstanding Government investment being recovered in a manner that does not damage the Nation's uranium enrichment capability; the uranium enrichment services and pricing structure being competitive; the recovery plan recognizing both the competitive nature of the international uranium enrichment market and the compelling national mandate for reduction of the Federal deficit; and the recovery plan recognizing the need for institutional restructuring of the Nation's uranium enrichment services, to include private sector involvement. The Department will be evaluating appropriate means to assess private sector interest in participating in uranium enrichment activities.

Question: How much has been spent thus far on spent fuel storage development? Provide a breakdown including fuel rod consolidation, dry storage and interim storage with funding levels for FY 85, FY 86 and FY 87.

Answer: A breakdown of expenditures is as follows:

CIVILIAN RADIOACTIVE WASTE R&D PROGRAM
(Outlays in thousands)

	Through FY 84	85	86	87
Program Management	1974	870	780	800
Dry Storage	1552	4471	4700	3060
Rod Consolidation	538	495	1800	250
Generic R&D	8510	2893	2220	1800
Section 223 Activities (International)	62	200	200	250
FIS	880	200	200	200
Total	13,516	9129	9900	6360
		Waste Fund Program		
Dry Rod Consolidation Process Development	—	450	2100	4860

CIVILIAN WASTE R&D

Question: Why are you proposing termination of the subseabed disposal sub-program?

Answer: No funds were requested to complete the subseabed program because the Department does not believe the activity has sufficient priority in relation to other nuclear waste research and development programs.

Nuclear Waste

Mr. Rusche, last year we discussed the total cost of the nuclear waste disposal program. You indicated that the total cost was in the range of $25-$34 billion and the low end of the estimate had increased by about $5 billion in the previous year.

Question: What is your best estimate today of the total cost? Has there been any change from last year? If so, why?

Answer: The current total system life cycle program costs from inception of the program (January, 1983) through decommissioning of the Second Repository range from $23-31 billion for the reference cases of the authorized system in terms of constant 1984 dollars. Sensitivity cases, which consider varying amounts of spent fuel generation and startup delays, range from $20-$38 billion. Last year, the corresponding costs were $24-$30 billion for the reference cases and $21-$35 billion for the sensitivity cases in terms of constant 1984 dollars. There are a number changes between the assumptions and cost calculations procedures used in the calendar year (CY) 1984 and (CY) 1985 analyses. Some of the more significant changes are summarized as follows:

- The CY 1985 analysis assumes that 16,000 canisters of Defense High Level Waste (DHLW) are disposed with the spent fuel while the CY 1984 analysis did not include DHLW.

- The CY 1985 analysis assumes an annual acceptance rate of 3000 MTU fuel, plus 400 MTU-equivalent of DHLW while the CY 1984 analysis assumed 3000 MTU of spent fuel only.

- The CY 1985 analysis assumes improved cask technology (need only accept 5 year old fuel) while the CY 1984 analysis assumed current cask technology for the reference case (designed to accept 120 day old fuel).

- The CY 1985 analysis assumes site-specific designs (based on the Two-Phase Feasibility Studies) while the CY 1984 analysis assumed the tuff design for all sites.

- The CY 1985 analysis assumes site-specific designs (based on a detailed MRS/Repository Interface Task Force Study) while the CY 1984 analysis assumed the tuff design for all sites.

- The CY 1985 analysis assumes two generic crystalline rock sites: a high-cost site and a low-cost site. The CY 1984 analysis assumed one generic crystalline rock site which was similar in geologic conditions to the tuff site.

Question: In FY 1986, the Congress reduced your initial request by $50 million. What is the impact, if any, of that adjustment? (Provide the Committee with a detailed allocation of the reduction among each activity).

Answer: Due to changes in the First and Second Repository program schedules and redirection of program planning for the MRS, the reduction of $50 million had a minimal impact on the program.

The following is a detailed allocation of the reduction among activities:

Activity	Amount (in millions)
First Repository:	
Site	$12.0
Exploratory Shaft	26.0
Subtotal, First Repository	38.0
Second Repository:	
Site	2.1
MRS:	
Design	6.5
Regulatory and Institutional	1.3
Systems Support & Prog. Mgmt.	2.1
Subtotal, MRS	9.9
Total reduction	$50.0

Nuclear Waste Fund

Question: As I pointed out in our hearings last year, the U.S. Geological Survey and the NRC were critical of the DOE site evaluation report on the Hanford waste site. Can you comment on what actions were taken, if any, by DOE to address the concerns of these other Federal agencies?

Answer: The Department has met with the NRC and the USGS on a number of occasions to address their concerns over the site evaluation report on the Hanford site and has adopted a number of their comments. Specifically, interactions with USGS are established through an interagency working group agreement that is reviewed annually. After each meeting, the USGS communicates their concerns, criticisms and recommendations to DOE in writing. These are addressed by DOE, discussed with USGS and to the extent possible incorporated into the characterization program. Meetings have been held with the USGS advisory group covering activities in hydrochemistry, hydrology, and geology. DOE has also conducted eleven technical workshops with the NRC on geochemistry, geology, and hydrology since January, 1984. Additionally, the Department is actively continuing to work with the NRC and other federal agencies during preparation of the Site Characterization Plans for the Hanford site as well as for the tuff and salt sites.

Question: Last year, Congress expressed support for the joint review by the States of Washington and Oregon of the potential impact of the Hanford site on the Columbia River. Can you give us a status report on those funds?

Answer: Through its grant to the State of Washington the Department provided funds to the State of Oregon in the amount of $20,000 for the last quarter of FY 1985 and $100,000 for FY 1986 for the purpose of reviewing potential impacts of the Hanford site.

Nuclear Waste

Question: Under the First Repository, provide the Committee with a breakdown for each activity and funding levels for FY 84, 85, 86 and 87 with an explanation for the need of any increase proposed in 87.

Answer: The following table is a breakout of each activity and associated funding levels for FY 84, 85, 86, and 87 for the First Repository program.

WBS Element	FY 1984	FY 1985	FY 1986	FY 1987
		(dollars in thousands)		
Systems	15,000	9,465	19,500	22,700
Waste Package	20,700	24,097	39,700	41,100
Site	97,560	73,680	118,300	150,100
Repository	41,200	29,069	64,650	87,800
Regulatory & Institutional	20,300	40,962	40,700	49,600
Exploratory Shaft	25,200	22,136	49,400	133,500
Test Facilities	5,200	4,602	6,200	5,200
Land Acquisition	100	0	9,600	7,600
Project Management	21,300	31,235	38,000	44,200
Total, First Repository	246,560	235,246	386,050	541,800

The FY 1987 increase totaling $155,750,000 will provide funding for the continuation of intensive site characterization activities that were initiated in FY 1986. At the three sites, increased borehole drilling and geologic analyses will provide surface and subsurface data to help determine site suitability as well as provide information needed to assist in developing waste package and repository designs. Assuming the tuff and basalt sites are chosen, construction of exploratory shafts will begin. In addition, the increase will also provide for the accelerated repository design and equipment, licensing, and quality assurance activities.

Question: Under the Second Repository, provide the Committee with a breakdown for each activity and funding levels for FY 84, 85, 86, and 87 with an explanation for the need of any increase proposed in 87.

Answer: The following table is a breakout of each activity and associated funding levels for FY 84, 85, 86, and 87 for the Second Repository program.

WBS Element	FY 1984	FY 1985	FY 1986	FY 1987
		(dollars in thousands)		
Systems	$ 1,300	$ 2,919	$ 3,500	$ 5,900
Waste Package	0	39	700	1,100
Site	7,438	13,568	16,400	45,700
Repository	457	450	1,400	3,800
Regulatory & Institutional	3,472	3,761	5,800	8,900
Exploratory Shaft	0	0	0	0
Test Facilities	1,136	1,136	3,000	7,500
Land Acquisition	0	0	500	800
Project Management	2,467	2,836	4,200	5,000
Total, Second Repository	$16,270	$24,709	$35,500	$78,700

The increase between FY 1986 and FY 1987 will provide for the preparation of area phase field studies, the expansion in the domestic and international cooperative programs, grants to affected States, and Indian Tribes, and engineering activities related to waste package and repository design.

Question: For the exploratory shaft work, provide a detailed breakdown of the funding proposed for each site in FY 86, 87, and 88 including the name of the contractors.

Answer: Provided below are three tables for the three sites identified in the December 1984 draft environmental assessments containing a detailed breakdown, by major category, for each Exploratory Shaft site and funding levels for FY 86, FY 87, and FY 88.

Exploratory Shaft at Hanford, Washington

	1986	1987	1988
	(dollars in thousands)		
Basalt Media:			
Design and Contruction.	11,946	33,992	30,706
Management and Integration. . . .	3,500	3,500	11,171
Operations.	200	200	13,270
Facilities Testing.	5,070	9,151	11,778
Capital Equipment	884	4,057	175
Total Basalt Site	21,600	50,900	67,100

Name of Contractors:

1. Rockwell Hanford Operations
2. Morrison-Knudsen Co., Inc.
3. Raymond Kaiser Engineers, Inc.
4. Parsons Brinckerhoff Quade and Douglas, Inc.

Exploratory Shaft at Yucca Mountain, Nevada Test Site

	1986	1987	1988
Tuff Media:			
Design and Construction.	872	14,329	11,210
Management and Integration . . .	3,183	3,766	4,619
Operations	---	2,823	6,009
Facilities Testing	8,056	17,445	24,501
Capital Equipment.	1,789	2,737	1,261
Total Tuff Site.	13,900	41,100	47,600

Name of Contractors:

1. Fenix and Scission, Inc.
2. Holmes and Narver, Inc.
3. Reynolds Electrical and Engineering Co., Inc.

Exploratory Shaft in Salt, Chicago Operations Office

	Fiscal Year 1986	Fiscal Year 1987	Fiscal Year 1988
	(dollars in thousands)		
Salt Media:			
Design and Construction	2,657	20,598	56,080
Management and Integration. . .	7,370	6,062	7,099
Operations.	728	555	584
Facilities Testing.	3,145	6,303	11,610
Capital Equipment	---	7,982	527
Total, Salt Site.	13,900	41,500	75,900

Name of Contractors:

1. Parsons-Redpath
2. Parsons Brinckerhoff Quade and Douglas, Inc.
3. Office of Nuclear Waste Isolation (ONWI)
4. Golder Associates, Inc.

Total All Sites	49,400	133,500	190,600

Question: Comment on the need for the increase from $21.3 million in FY 86 to $33.4 million in FY 87 for transportation and systems integration. Please provide a breakdown of all activities proposed with an explanation and FY 1986 and FY 1987 funding levels.

Answer: Of the total increase of $12.1 million between FY 1986 and FY 1987, $9.3 million is associated with the transportation program. Transportation cask development contracts will be executed and account for the largest portion of the increase. An increase in economic and environmental analysis is proposed to provide route specific EIS information. Development of technology and data systems will continue and program management requirements will increase.

The remaining increase of $2.8 million is associated with the systems integration program. Increases are required primarily for prototype development and testing in the area of waste handling and packaging. Accelerated waste management systems integration activities are proposed to assure that the various parts of that system are integrated into an efficient and cost-effective system.

Proposed funding levels for FY 1986 and FY 1987 for transportation are $9.9 and $19.2 million respectively. Proposed funding levels for systems integration for FY 1986 and FY 1987 are $11.4

and $14.2 million respectively. Activities proposed within the transportation program are categorized into four major tasks: transportation systems acquisition; institutional programs; environmental and economic analysis; and technology development and testing support. The majority of funding proposed for FY 1987 will be used to complete preliminary cask design efforts initiated in late FY 1986, plan for testing, and develop needed data for cask design.

Activities proposed within the systems integration program include updating and further implementation of the Systems Engineering Management Plan to develop the technical baseline for the waste management concept. System performance assessments will be conducted. Assessments of system cost and performance models, risk analysis studies and alternative strategies will be performed. Engineering development of various waste handling and packaging concepts will be advanced. In FY 1987, efforts will also address interface and logistic problems between the waste generators, handling and packaging operations and repository operations. In FY 1987, prototypical demonstrations of dry rod consolidation techniques will be conducted as well as development of competitively selected projects for consolidation/packaging equipment and multi-purpose canisters.

Question: Describe the progress in the MRS portion of the program.

Answer: The Department has included funding for the activities critical to the timely deployment of a Monitored Retrievable Storage (MRS) facility in the FY 1987 budget provided to the Congress on February 4, 1986. On February 5, the U.S. District Court for the Middle District of Tennessee issued a declaratory judgment that the NWPA required the Department to consult and cooperate with the State during siting studies conducted prior to Congressional authorization of construction of an MRS. This judgment permanently enjoins the Department "from making any proposal to Congress or filing any documents with Congress which rely on siting studies... already completed". The specific proposal for an MRS facility mandated in Section 141 (b) of the Nuclear Waste Policy Act was scheduled to be provided to the Congress in early February after the Department had received the comments from the Nuclear Regulatory Commission, the Environmental Protection Agency and the State of Tennessee to send to the Congress with the proposal. Although the proposal, its required supporting documentation, and the comments from the State and other federal agencies are ready for submission to the Congress, the District Court injunction prevents the Department from submitting the documents.

Question: Provide a breakdown in the form of a table showing each activity in MRS with funding levels for FY 86, 87, and 88.

Answer: The FY 86, 87, and 88 MRS funding levels are as follows:

(Dollars in Thousands)

MRS	FY 86 Appropriation	FY 87 Request	FY 88 Estimate
Design	$ 0	$14,600	$25,000
Regulatory and Institutional	3,000	21,500	17,000
Systems Support & Prog. Mgmt.	0	9,900	8,000
Total	$3,000	$46,000	$50,000

Question: What would be the funding impact of a 6 month/1 year delay in the submittal to and/or approval by Congress of the MRS proposal?

Answer: A six month/1 year delay in the submittal to and/or approval by Congress of the MRS proposal would have an immediate funding impact in that program and project funding levels for each year in the ten year period of design and construction would change according to the length of delay in approving the MRS. Additionally, due to inflation, MRS life-cycle costs would increase as a function of the length of delay.

QUESTIONS SUBMITTED BY SENATOR McCLURE

Nuclear Fission

Question: The Department's 1987 budget submittal discusses the "significant shift in nuclear energy research and development program emphasis and priorities towards supporting national security requirements, including the Strategic Defense Initiative." This shift reduces advanced reactor R&D funding by $79 million, and increases the space and defense power systems to $72 million.

Has a separate office been established within the department to direct this increased effort or does the department intend to establish such an office?

Answer: In July 1985, the Department's Nuclear Energy activities were reorganized. As part of this reorganization, an Office of Defense Energy Projects and Special Applications was formally established under the Deputy Assistant Secretary for Reactor Systems, Development and Technology. This office is composed of two divisions: The Division of Defense Energy Projects, whose prime focus is on space and terrestrial reactor systems for defense, and the Division of Special Applications, with a similar focus on isotopic systems. This office has served to provide the required focus to the Department's defense nuclear energy activities as well as to centralize technical and management expertise on various joint projects where multi-agency interaction is essential.

Question: With the growing number of military space application projects currently planned by the department, is an effort being made to center project management offices at specific national laboratories, such as the Nuclear Regulatory Commission is doing in its newly developed "technical integration centers"?

Answer: The Department is indeed moving to center project management activities at its field offices and laboratories. For example, a project office has been established for the SP-100 program which jointly involves NASA's Jet Propulsion Laboratory and DOE's Los Alamos National Laboratory. A project office has also been established at the Idaho Operations Office to manage the Multimegawatt Terrestrial Powerplant (MTP) and efforts are underway to establish a field Project Integration Office for the multimegawatt space power program.

Question: It is envisioned a number of existing resources developed as part of the nuclear energy program at DOE will be used to support the SDI program. What steps is the department taking to define SDI requirements to guide application of DOE resources?

Answer: The basic approach used by the Department to define Strategic Defense Initiative (SDI) and Air Force requirements is to work closely with the ultimate mission users of both land-based and space-based power sources.

For example, within the SP-100 program, efforts are focused on a 300 KWe electric propulsion orbital transfer reference mission. This reference mission was established by the SDI Office and defines the requirement for the reactor design and hardware to be built and tested.

For the multimegawatt program, SDI has defined three modes of power use--continuous, alert and burst--with specific durations and levels of power for each. Power producing concepts have been defined with the potential to meet these requirements. These requirements, in turn, identify the technology development programs required to support the various concepts. Typical technical areas are: Fuels, Materials, Heat Rejection and Transport, Thermal Hydraulics, Instrumentation and Control, Energy Conversion and Storage, and Safety. These development programs specify the DOE resources needed to meet the SDI needs.

In a related activity to guide application of DOE resources, the Department is currently correlating user needs and surveying available test facilities to ensure that the SDI program testing needs are being met in a cost effective manner and without duplication of effort.

Question: The shift from civilian to military nuclear R&D could have vitally important international ramifications that will directly affect our nation. Internationally, the use of nuclear energy is growing and further growth is inevitable. The U.S. has so clearly shaped and led the world in the responsible use of nuclear energy, what will be the long term international impact of the U.S. opting out of civilian development and applying its resources to military requirements?

Answer: The United States is not opting out of civilian nuclear development. The Department has provided R&D support to both defense and civilian areas and will continue to do so in the proposed programs. It is our intention to integrate and coordinate those efforts to the maximum extent so as to minimize the overall Federal cost. The priority of military programs has not changed; programs have expanded and moved ahead as planned while the overall funding stringencies have tightened. The U.S. still possesses broadly based and advanced liquid metal reactor technology in the world and continues to exhibit leadership in this arena.

Question: Will international research agreements continue under this new policy if other countries would have to agree essentially to be part of U.S. military research?

Answer: Providing support for defense activities through utilization of common facilities, technology, and manpower will not detract from the Department's ability to engage in civilian advanced nuclear reactor cooperation with foreign partners. While there is a commonality in technology and facility requirements, current and prospective joint cooperative activities are sufficiently different from anticipated domestic defense program efforts that we see little difficulty in maintaining a separation between these activities, and in conducting distinct joint international collaborative programs. Thus, foreign partners will not have to agree to be part U.S. military research, and we are confident that we will be able to continue and expand collaborative research with others.

Question: Can the U.S. continue to encourage and support joint cooperation research between our country and other nations such as Japan, France and Germany?

Answer: Yes. The proposed FY 1987 civilian program continues joint cooperative programs on research between our country and other nations. Although the majority of our current international effort is with the Japanese, we will continue efforts for greater involvement with Germany and France. Public domain information on our advanced Liquid Metal Reactor and High Temperature Gas Reactor concepts has been received with great interest in Japan and France and may well become the basis for the United States establishing future collaborative agreements.

Question: A number of countries are forging ahead in nuclear R&D, and these have challenged our lead in the nuclear energy market. Will not this shift further erode our nation's marketing capability?

Answer: In FY 1987, our efforts within the civilian program regarding defense will be limited to determining the suitability of advanced civilian designs for defense applications. The Department's primary effort will remain focused on advanced civilian reactor concept development and supporting R&D with emphasis on competitive economics, passive safety, and improved licensability. To date, progress has been encouraging; costs appear to be competitive with LWR's and coal plants, innovative passive safety features have been designed and will be tested, NRC interactions have been positive, and plant availability estimates are high. Public domain information available on these advanced designs is creating a great deal of interest in Japan and France. We believe that these designs will provide the basis for the United States retaining its leadership role in the nuclear field and potentially recapturing some overseas markets.

Low-Level Waste

Question: Last year, Congress enacted the Low-Level Radioactive Waste Policy Amendments Act (P.L. 99-240), which requires the development of regional low-level waste disposal facilities while extending access to the existing facilities until 1993. What are the major responsibilities assigned to DOE by this recent act to ensure these LLW facilities are operating by 1993?

Answer: The Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240) assigns several new responsibilities to the Department of Energy (DOE). These include responsibility for disposal of "greater-than-Class C" commercial low-level waste; management of an interest-bearing escrow account to rebate to unsited States and regions 25 percent of disposal fee surcharges where those States or regions meet certain milestones; and the allocation of up to 800,000 cubic feet of disposal capacity among the three commercially-operated disposal sites for low-level radioactive waste generated by utilities as a result of unusual or unexpected operating, maintenance, repair, or safety activities.

In addition, DOE is required to prepare several reports for Congress, including (1) a report due in January 1987 on how it will ensure the safe disposal of greater-than-Class C low-level waste; (2) an annual report on (a) the progress of States and compact regions in developing new disposal capacity; (b) the practices of industry to manage, store, treat, ship and reduce in volume low-level radioactive waste; and (c) projections for storage and disposal requirements for the following year; and (3) a report on how applicable States and regions expended the rebates from the escrow account of 25 percent of the disposal fee surcharges.

Finally, the Department is to provide assistance to States and compact regions to help them in developing new disposal facilities. It should be noted that DOE does not believe that it has any responsibilities which are sufficient to ensure the development of new facilities.

Question: Has DOE established the escrow account for collection of surcharges? If not, when does DOE expect that the account will be ready?

Answer: The Department has established an escrow account for the collection of surcharges with the Treasury Department. Currently, DOE is working with the three States that host operating low-level waste disposal facilities, Nevada, South Carolina, and Washington, regarding receipt of surcharges for deposit to the account.

Question: Is DOE's budget sufficient to execute the added responsibilities assigned to it since passage of the Act?

Answer: The Department will meet the added responsibilities of greater-than-Class C waste disposal, management of the escrow account, allocation of unusual waste volumes, and the several annual reports required by the Act. The extent to which DOE's informational and analytical capabilities can be expanded to help generate the annual reports is contingent on resources available. Funding is requested for technical activities furthering the nationwide development of disposal capacity.

Question: Will DOE continue financial and technical assistance to States for the development of their compacts?

Answer: The Department has not requested any funds to provide financial assistance to States or regions in FY 1987. The Department feels that Federal support of State and regional disposal facility development should be limited to the provision of technical data and information, general technical assistance, and the evaluation of improved technologies for treating, packaging and disposing of low-level waste. Technical assistance will be provided from within the Department's system of scientific and technical personnel, national laboratories, and other contractors. Technical information will be made available to help States and compact regions plan and conduct each required phase of low-level waste disposal facility development according to the milestone requirements in the Act.

DOE believes that since the disposal of low-level waste is the responsibility of the States, those States who want increased Federal Government assistance should be prepared to reimburse the Federal Government for any expanded role. There are a number of mechanisms by which States and compact regions may be able to raise funds to develop low-level waste disposal sites without relying on the Federal

Government for further direct financial support. In separating the responsibilities of the States and the Federal Government, it would appear that the language of the Act also would encourage the States and compact regions to develop financially independent means for their low-level waste management activities.

Question: Does the proposed budget affect the responsibilities assigned to DOE for reporting to Congress on the programs of the low-level waste program?

Answer: Section 7(b) of the Act requires the Department to prepare an annual report to the Congress that would include (1) the progress of States to develop disposal facilities; (2) the practices of the industry to manage, store, treat, transport and reduce the volume of low-level radioactive waste; and (3) project storage and disposal requirements for the following year. In order to perform the latter parts of this requirement, the Department would have to collect from the private sector information not currently available and would also have to expand its data base capabilities. For the first annual report, the Department is planning to report only on the progress of the States and regions in developing new disposal capacity and to provide information about low-level waste shipped to disposal facilities. The other features of the annual report on generator and industry practices require time to acquire information from the industry and to expand our analytical and data base capabilities. This information shall be included in future reports as resources permit and information can be obtained.

QUESTIONS SUBMITTED BY SENATOR KASTEN

Geologic Siting

Question: Mr. Rusche, have you or has anyone from DOE been in contact with Mr. George Friedrich, a prospector in the Wolf River batholith region, who has found that the batholith is covered with extremely fractured rock with water freely flowing through these fractures?

Answer: To the best of our knowledge, no DOE personnel or contractors have been in contact with George Friedrich.

Question: Have you had the opportunity to speak with Ken VanDyke, a member of "Working for Independence from Nuclear Danger" (WIND), who claims that DOE's data is flawed and incomplete? He cites the example of DOE's failure to mention most of the 240 lakes and 47 rivers and streams in Waupaca alone?

Answer: DOE believes that Mr. VanDyke made this or a similar comment at a recent briefing in Wisconsin and it will be considered in the finalization of the Area Recommendation Report.

Question: In addition, has DOE addressed the concern of Robert Halstead, State Energy Policy Analyst, that current high radiation levels in the batholith could result in even higher levels in the event of the siting of a nuclear waste repository?

Answer: At a number of briefings, statements were made by Robert Halstead and others that Wisconsin has higher background radiation due to fall-out from past nuclear weapons testing. The extent and level of this background radiation compared to other States is not part of the present analyses.

Some portions of the batholith, in South Central Shawno and North Central Waupaca Counties are known to have had exploration for uranium and berylium in the past. Although these areas have been investigated since the 1950's no commercial deposits have been identified. The background radiation for the rest of the batholith compared to other crystalline rocks in the world has not been evaluated. Naturally occurring radiation in the rock body will be examined during the area phase investigation. At the same time, the environmental effects of siting a repository in the batholith will be evaluated.

Second Repository Site Selection Process

Question: How swiftly will DOE delist Wisconsin's Wolf River Batholith Site upon further evidence of DOE data gaps, misinformation and DOE's failure to follow its own site selection criteria?

Answer: The deferral or disqualification of the Wolf River Batholith Site, if warranted, could occur at either of two decision points: (1) the finalization of the Draft Area Recommendation Report (ARR) or (2) during the area characterization phase (1987-1991).

Property Owners

Question: What legal options has DOE provided for property owners and Indian Tribes?

Answer: After the President selects a candidate site the U.S. Department of Energy (DOE) will identify what areas will need to be purchased by DOE, and what areas may be leased. Decisions regarding the purchase or lease of other areas on the site will be made in consultation with States, Indian Tribes, and affected parties. DOE's policy is to minimize intrusion on landowners, as much as possible. Whether DOE purchases or leases the land, the Department will attempt to reach voluntary agreements with landowners and avoid condemnation proceedings, if possible.

First Repository Site Selection Process

Question: At what stage of the site selection process is DOE with regard to the Western site?

Answer: On December 20, 1984, DOE issued draft environmental assessments (EAs) for the first repository which proposed that site characterization activities be conducted at three of the nine candidate sites: Deaf Smith County, Texas; Hanford, Washington; and Yucca Mountain, Nevada. An extensive public comment period and numerous public briefings and hearings in the affected States produced over 20,000 comments on the draft EAs. Final EAs are being prepared to address these comments and are to be issued in April 1986 for the five sites being nominated by the Secretary of Energy as suitable for site characterization. Concurrent with the nomination, the Secretary of Energy will recommend to the President for selection three of the nominated sites for characterization. In 1991, upon completion of detailed site characterization, the President will select the preferred site as the location for development as the first repository.

Consultation and Cooperation Agreement

Question: One of the stated purposes of the Nuclear Waste Policy Act of 1982 is the definition of a relationship between the Federal and State governments with respect to the disposal of nuclear waste. Why has DOE declined to negotiate a consultation and cooperation agreement with the State of Wisconsin?

Answer: The Department has agreed to begin informal discussions now, although the Department is not required to do so at this time under the NWPA. If Wisconsin is identified as containing a potentially acceptable site in the final Area Recommendation Report, the points agreed upon during these discussions could be incorporated into a formal consultation and cooperation agreement.

Comment Period

Question: DOE has taken over five years of research and hard work through the Crystalline Repository Project to identify 12 proposed potentially acceptable sites. Why has DOE refused to extend the 90 day comment period so that States and Indian Tribes can respond in a competent and responsible manner? Since DOE has been way off its schedule in the site selection process, and since it is highly unlikely that DOE will issue this report on schedule, why won't DOE accommodate the needs of the affected States and Indian Tribes by formally extending the April 16 deadline?

Answer: DOE believes that the 90-day comment period is appropriate for several reasons. The draft ARR presents the results of the application of a formal screening methodology to an established data base. Together, the Final Region-to-Area Screening Methodology for the Crystalline Repository Project (issued in April 1985) and the Final Regional Characterization Reports (issued in September 1985) comprise the core of information used for regional screening. These documents were reviewed by the States prior to finalization and full consideration was given to all comments received.

To aid in this process, DOE provided the States with computer access to the regional data base in October 1985. The purpose of this early access was to provide the States with the ability to rapidly review DOE screening results and the data utilized in identifying candidate areas for further study.

The 90-day public comment period is consistent with the time for public review afforded other comparable decision documents, including the draft Environmental Assessments supporting the proposed nomination of sites in connection with the first repository program. However, as in the case of the draft Environmental Assessments, we will consider late comments to the maximum extent feasible.

Risk Assessment

Question: What types of precautions are in place to address repository-related accidents?

Answer: At this point, we are in the early stages of repository design; there are no facilities currently in place. As the repository design develops, we will concurrently evaluate potential accidents and provide mitigating capabilities in the facility design, as appropriate.

We believe that mitigation of repository related accidents will involve two processes. First, if a design can be modified so as to prevent the occurrence of an accident, this will be done, provided the modification does not inhibit the operation of the system component. Second, procedures and training may be a more effective tool to prevent or mitigate accidents. In some cases, a combination of design and procedures may be the most appropriate action. In any event, as the repository design progresses, we will evaluate what actions are appropriate in order to establish the needed precautions to address repository related accidents.

Question: Are firefighters equipped to handle fires at nuclear installations or contain spills?

Answer: All licensed nuclear power plants must comply with regulations related to firefighting. Specifically, the following regulations apply:

10 CFR 50.48	Fire Protection
10 CFR 50 App. R	Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979.

Assuming compliance with these regulations, each facility is equipped to handle fires. In regard to spills at nuclear power facilities plant, operating procedures are normally used to specify the process for handling spills.

We expect that similar regulations and procedures, appropriate for a repository, will be in place by the time a repository becomes operational.

Question: In the tragic event of an accident, will the Federal Government accept full and unlimited liability?

Answer: DOE holds the view, and we are operating with the recognition, that the present Price-Anderson coverage is applicable to the Department's high-level nuclear waste activities. The Price-Anderson indemnity system provides indemnification of States and local governments, in addition to DOE contractors, for any public liability resulting from a nuclear incident. With respect to whether the present limitation is adequate for any incident involving nuclear waste, we refer to the original intent of Price-Anderson. Congress stipulated an upper limit of assured funds to be provided on a rapid basis if needed. If an incident occurred involving damages in excess of that amount, Congress reserved for itself the responsibility to take whatever action is deemed necessary and appropriate to protect the public. We concur in this approach for the waste program activities.

QUESTIONS SUBMITTED BY SENATOR DOMENICI

Uranium Enrichment

Question: In your testimony (p.64) you have stated that "the key to the survival of the U.S. uranium enrichment business is to get near-term prices down into the competitive range by aggressively reducing costs." And yet, DOE is also proposing to return $100 million to the Treasury as part of the repayment in 86, and $235 in 87. Except to liquidate your stockpile and inventory of uranium, can the program afford to reduce price and to make payments at the same time?

Answer: The FY 1987 budget request does enable the Department to reduce our selling price from $125 to $119 per SWU and yet make a $235 million payment to the Treasury. This was achievable by our cost reduction efforts and by introducing an initiative to transfer the AVLIS technology to the private sector. Also, we will be reducing our enriched uranium inventory to minimum working levels over the next 2 years and overfeeding some uranium from our natural uranium stockpile. We believe future prices can be further reduced and payments made to the Treasury with continuation of cost reduction activities and successful transfer of the AVLIS technology.

Question: Your budget request assumes that the private sector would pick up the development of the world's most advanced enrichment technology, the AVLIS process, in 1988. I understand that it will require at least $800 million to continue the feasibility study and demonstration process and another $1.2 to $1.5 billion for capital outlay to start the project. Do you have any takers from private sectors?

Answer: The Department will be evaluating appropriate means to assess private sector interest in participating in uranium enrichment activities. To date the Department has not identified any private sector participants willing to invest in AVLIS technology and deployment.

Question: Will the fund to be used for repayments be otherwise used to update your production facilities and to apply AVLIS process?

Answer: In the past, funds that could have been used for payments to the Treasury were used for reinvestment in uranium enrichment. However, the Administration is proposing that these funds be paid to the Treasury to assist in deficit reduction activities.

Subseabed Disposal

Question: Mr. Rusche said that DOE may desire to "go back" to the Subseabed Project in the future. How much would it cost to restart the Subseabed Project if it is terminated this year?

Answer: To carry the subseabed program through an assessment of concept feasibility to the level previously envisioned, it is estimated to require at least $100 million based on 1986 dollars. Because of the steps currently being taken for the orderly closeout of the subseabed program, including the documentation of results available to date and the storage of specially fabricated test equipment, additional costs for start-up are expected to be minimized. Although additional costs for equipment and repetition of work is expected to be minimized, some losses caused by dissolving and reconstituting research teams will be unavoidable.

Question: Mr. Rusche mentioned the institutional and political questions regarding subseabed disposal. What is DOE doing to address these issues? Specifically, how does DOE plan to address these issues in the London Convention?

The DOE, through its prime contractor Sandia National Laboratories, has been conducting a limited program to address institutional and political issues related to the subseabed disposal option. This program has been coordinated with similar activities undertaken by the Seabed Working Group of the NEA/OECD. The subseabed program has provided expertise on technical, environmental, and scientific matters for the U.S. government representatives to the London Dumping Convention; expert advice on legal, political, and institutional issues has similarly been provided. However, because the subseabed program is entering an orderly closeout, it is necessary to devote the program resources to documenting and finalizing, to the extent possible, the scientific research performed to date. Therefore, support for the U.S. delegation to the London Dumping Convention will be limited for both scientific and institutional issues. However, to the extent possible, we will continue to support requests for technical assistance and, of course, will continue to monitor activities of foreign entities in the areas of subseabed disposal.

Question: What is the present financial status of the Subseabed Project? Have all of the funds authorized and appropriated for FY 86 been made available so that the Project can be terminated in an orderly fashion? I understand that the Subseabed Project needs to reprogram $1.2 million of equipment funds to expenses. Has this reprogramming request been filed? If not, when will the necessary reprogramming request be filed? I understand that the Subseabed Project has $1.4 million in its current financial plan available for forward financing and that the Project needs these funds in order to complete an orderly termination. Has DOE made the funds available? If not, why?

Answer: All the funds authorized and appropriated for the Subseabed program for FY 1986 have been made available to the appropriate financial plan allottees. The Office of Civilian Radioactive Waste Management (OCRWM) developed a detailed list of commitments for the balance of funds in operating and equipment necessary to provide for an orderly termination of the project, and prepared a draft request for reprogramming incorporating the list of commitments. OCRWM is working closely with the Department's Office of Budget and it is anticipated that the request for reprogramming will be submitted in the near future. The $1.4 million for forward financing has been made available.

SUBCOMMITTEE RECESS

Chairman **Hatfield**. Whereupon, at 3:15 p.m., the subcommittee was recessed, subject to the call of the Chair.

[Whereupon, at 3:15 p.m. Thursday, March 13, the subcommittee was recessed to reconvene at 2 p.m. Thursday, March 20.]

ENERGY AND WATER DEVELOPMENT APPROPRIATIONS FOR FISCAL YEAR 1987

THURSDAY, MARCH 20, 1986

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 2:07 p.m. in room SD–192, Dirksen Senate Office Building, Hon. Mark O. Hatfield (chairman) presiding.

Present: Senators Hatfield, Abdnor, and Burdick.

DEPARTMENT OF ENERGY

POWER MARKETING ADMINISTRATIONS

STATEMENT OF DONNA R. FITZPATRICK, ASSISTANT SECRETARY, CONSERVATION AND RENEWABLE ENERGY

OPENING REMARKS

Chairman HATFIELD. The hearing will come to order.

The purpose of our hearing this afternoon is to receive testimony from the five Federal Power Marketing Administrations—for the last time [laughter]—which are within the subcommittee's jurisdiction. We extend a warm welcome to each of the Administrators and look forward to receiving your status reports and statements on your 1987 budgets.

Also, we welcome again Donna Fitzpatrick, Assistant Secretary for Conservation and Renewable Energy, as our first witness today.

Madam Secretary, we will receive your testimony first, and then if you have other schedules, we will excuse you or you may remain, depending on your testimony. [Laughter.]

We will put your full statement in the record, and you may proceed to summarize.

Miss FITZPATRICK. Thank you, Mr. Chairman and members of the subcommittee.

INTRODUCTION OF ASSOCIATES

I am pleased to be here today with the power marketing Administrators to present their budget requests for fiscal year 1987. First, I would like to introduce my colleagues. Beginning on your right is Mr. Robert Cross, who is Administrator of the Alaska Power Administration; Mr. Peter Johnson, Administrator of the Bonneville Power Administration; Mr. Harry Geisinger of the Southeastern Power Administration, Mr. Ron Wilkerson of Southwestern; and Mr. William Clagett of the Western Area Power Administration.

DEFEDERALIZATION OF PMA'S

The President's 1986 budget request included a specific proposal for the sale of the Alaska Power Administration. Pursuant to that, in May 1985, the APA and the Alaska State Office of Management and Budget entered into an agreement to evaluate the issues involved in that proposal. The results of their study should be finalized next month and will be made available to the committee.

In fiscal year 1987, the Department of Energy plans to expand on this effort and pursue defederalization of all five Power Marketing Administrations. Utilities are not normally a Federal responsibility, and we believe that non-Federal owners could operate the PMA's just as efficiently or more efficiently than the Federal Government.

The administration will pursue defederalization through an open, competitive process which will include the development of legislative proposals. Working groups are being established to look at all possible options. Before the transmittal of defederalization legislation, we will seek the views of concerned groups and individuals, including congressional delegations, State and local officials, current customers, the financial community, and public power and private sector energy interests. Funds are included in the budget for operating the Power Marketing Administrations in 1987. It is expected that all the PMA's will transfer from Federal control by fiscal year 1991.

REPAYMENT PROPOSAL

The President's fiscal year 1987 budget request also proposes to legislatively modify the repayment practices of the five PMA's. Our proposal calls for the PMA's to repay the unpaid balance of principal for power investments, assuming a useful service life of up to 50 years, at a level not less than would be required under a straight-line amortization schedule. Repayments of principal under this proposal, if necessary, could be deferred, subject to the same terms and conditions applicable presently to deferred interest payments; that is, current interest rates would be paid on the portion of amortization deferred, because the deferral helps finance current operations.

The proposed changes are intended to protect the interests of the Nation's taxpayers. The impact of this repayment proposal is modest compared to the proposal made in last year's budget.

Mr. Chairman, that completes my statement. The Power Marketing Administrators have their own statements and I would be glad to answer any questions you may have.

Chairman HATFIELD. Madam Secretary, I recognize you are here on assignment. [Laughter.]

We accept that role, believing in the three branches of government.

DEFEDERALIZATION OF PMA'S

On page 2, I would like to make sure that we have the horse before the cart, and I just want to do this purely for clarification. On the top of the page, you say, "The administration will pursue defederalization through an open, competitive process, which will include the development of legislative proposals."

Now, you go on to spell that out a little bit more clearly, but I want to make sure that we have Secretary Herrington, you and all the other witnesses here in total and complete agreement, including Mr. Jim Miller and others over in OMB. Would that not have read more appropriately, "The administration will seek legislative proposals before it pursues defederalization"? Bear in mind before you answer, we have already heard from the Secretary who happens to be a step higher in the hierarchy. [Laughter.]

Miss FITZPATRICK. Yes, sir, I was here, and the Secretary assures you, and I repeat the assurance, that there will be no transfer of any Power Marketing Administration without the approval of Congress.

Chairman HATFIELD. Thank you. That is good.

So then if I were your English teacher giving you this paper back, I would then suggest that the wording of that sentence would follow: "The administration would seek legislative approval before pursuing defederalization through an open, competitive process."

Miss FITZPATRICK. Well, I had an English teacher, Mr. Chairman, who had three marks: a C-plus, a C-minus, and a C-me. That is a C-me, and I repeat, we cannot make a change in the status of the Federal Power Marketing Administrations without the approval of the Congress, and we will study it and come to the Congress with our proposal before any action is taken.

Chairman HATFIELD. You have no existing authority to proceed with the sale or divestment of any PMA or any part of any PMA at the moment?

Miss FITZPATRICK. That is correct, Mr. Chairman.

REPAYMENT REFORM

Chairman HATFIELD. Thank you. Nor would you have any authority at this time to modify the repayment practices of the five PMA's without new legislative authority? Let's put it this way: you don't have any such authority at this moment?

Miss FITZPATRICK. Mr. Chairman, I don't know that we have such authority. I do know that the Secretary is committed not to do that without legislative approval.

Chairman HATFIELD. Thank you.

As you know, dipping back into the classroom, repetition is the first law of learning. [Laughter.]

I don't want to be repetitious today as we have been with the Secretary and other officials of the administration. Thank you, Madam Secretary, for a very succinct, clear, and disagreeable statement. [Laughter.]

If you would like to proceed first to Alaska by the order of alphabet.

Senator Burdick, do you have any questions for the Secretary?

Senator BURDICK. Oh, yes.

Chairman HATFIELD. I am sorry. I do not excuse you yet, and we will hold Alaska for a few moments while the Senator from North Dakota asks questions.

DEFEDERALIZATION OF PMA'S

Senator BURDICK. Thank you, Mr. Chairman.

I was listening intently to what the Chairman had to say about grammar and other things appertaining thereto, so I am going to ask you a question along that same line. What is the difference between defederalization and privatization?

Miss FITZPATRICK. Privatization, Senator, implies that the transfer would be made to a private party, say, an investor-owned utility. Defederalization means simply that the entity which takes over the PMA would not be a Federal agency. It could be a regional compact, it could be a State, it could be a consortium formed by the public power authorities that exist today, municipal power authorities, or rural electric co-ops. It is intended to be as broad as possible, that it not be a Federal agency.

Senator BURDICK. In either case, it is no longer a Federal agency.

Miss FITZPATRICK. That is true.

Senator BURDICK. The administration is advancing a proposal to sell or privatize the Power Marketing Administrations. There is a claim that this privatization will result in deficit reduction. I am concerned this would only result in a short-term reduction, whereas the long-term continued Federal operation would result in greater deficit reduction once the Federal investment is retired. If the administration's motivation in this matter is simply deficit reduction, why not hold on to these assets; then, once the Federal investment is retired, revenues would far exceed those revenues which OMB estimates would be received through privatization in 1991?

Miss FITZPATRICK. Senator, that short-term budget deficit reduction is a secondary effect and intention of the proposal. The principal reason that the proposal is being made is in order to keep the Federal Government out of activities which are not properly or most effectively the role of the Federal Government. So the emphasis is on the defederalization and not on budget reduction or deficit reduction.

Senator BURDICK. The Federal Government has been in this area for a long time. Suddenly, it has decided it shouldn't be there?

Miss FITZPATRICK. No, Senator. I think that everyone agrees that the history of Power Marketing Administrations goes back more than 50 years and that the involvement of the Federal Government at that time, and for many years after that, was most proper and necessary for the development of these resources and the well-being of the areas that they serve.

The proposal now is that those areas and the resource development have matured to the point where they could now take control of their own resources on a regional basis and that it is no longer necessary for the Federal Government to be involved.

INCREASED ELECTRIC RATES

Senator BURDICK. I am concerned that the sale of these assets would result in a private owner financing their investment at a higher rate of interest. Would this lead to an increase in electric rates charged to consumers in order to recover the higher cost of financing?

Miss FITZPATRICK. Senator, we have been taking a look at what the interest might be and some possible financing arrangements. That is in the very early stages of study, and we don't think we are able, now, to predict what the interest rates might be. As we know, interest rates are trending downward, but we also realize that they can be rather volatile.

Senator BURDICK. Would there be a tendency under private financing to pay higher rates than under Government financing?

Miss FITZPATRICK. In the cases where the applicable interest rates are now in the range of about 3 to 4 percent, I think that that is probably true. Many of the interest rates are higher than that. The policy has been for some years that all new investment and new installations being brought on line be financed at the then current interest rates, and I think probably market rates now could be below what those rates would have been.

Maybe somebody would want to correct me on that, but I think that at least the interest rates that are currently being applied cover a rather broad range.

Senator BURDICK. We are comparing rates at any particular period of time?

Miss FITZPATRICK. That is correct.

Senator BURDICK. Of course, now there is a difference in the rates from a year ago and so forth. As of a particular time, it is my contention that the rates under private financing would be higher, and I think you agree.

Miss FITZPATRICK. That could be true; yes.

MARKETING PREFERENCE

Senator BURDICK. What assurances would there be to require a private owner to comply with the various marketing preferences?

Miss FITZPATRICK. One of the basic guidelines, Senator, that we are using in pursuing this proposal, is that the current benefits of the customers, including the preference clause, should be recognized and the means should be found to protect them.

Senator BURDICK. What would happen to existing purchase and sale contracts now pending?

Miss FITZPATRICK. All of those contracts and rights evolved from them are included in the guideline that I just mentioned. There is no intention, for example, to abrogate existing contracts. All of that would be subject first to review to see exactly what the contracts require and then negotiation with the parties.

WAPA MARKETING OF SURPLUS POWER

Senator BURDICK. On another matter, currently, electric cooperatives in my area are experiencing enormous surpluses of power. Is WAPA aware of this problem, and do you see areas where WAPA could facilitate the marketing of this surplus power?

Miss FITZPATRICK. Could I ask the Administrator of WAPA to answer that question?

Senator BURDICK. Certainly.

Miss FITZPATRICK. Thank you.

Mr. CLAGETT. Senator, I appreciate the question. We are aware of the surpluses. Unfortunately, they are in neighboring areas, also. I can assure you, we are doing everything we can to be cooperative and helpful, but unfortunately, if the loads aren't there, it is very difficult to sell a surplus product.

Senator BURDICK. Mr. Chairman, I think that is all I have at the moment.

Chairman HATFIELD. All right.

The Senator may have further questions that he may, of course, submit for the record.

The Senator from South Dakota?

Senator ABDNOR. I would like to ask Miss Fitzpatrick and, if it is possible, Mr. Clagett, a question. I am not a school teacher. Unlike the chairman, I tried teaching school and doubt I would measure up to him. That is all right, though. I'll ask a question and you be the teacher.

DEFEDERALIZATION OF PMA'S

Is both the defederalization and the privatization of the Public Power Administration a dead issue now?

Miss FITZPATRICK. We are proposing defederalization, Senator, yes.

Senator ABDNOR. Are you going to introduce legislation now.

Miss FITZPATRICK. Yes; we would introduce legislation.

Senator ABDNOR. You know it will be opposed by some of us?

Miss FITZPATRICK. Pardon me?

IMPACT ON IRRIGATION ACTIVITIES

Senator ABDNOR. I think there are a lot of problems with this proposal. Have you ever thought about it? I couldn't help but wonder what would happen if you were successful. My State, Mr. Chairman, gave up well over 500,000 acres of land for the Missouri River reservoir. They certainly didn't ask for the dams at the time. It wasn't their idea. We were, however, supposed to get certain things in return, and I am not going to go back into that story again.

One of the things we were going to get, along with irrigation and a number of other things, was some 170 megawatts of power that was going to be reserved for irrigation. How would that work? How could we keep the Federal Government committed to that if you were to sell these reservoirs off? Would we just forget all our past promises and everything that we were going to do?

Miss FITZPATRICK. No, Senator. What we are proposing is a transfer of the power marketing activity; all of the other activities in the Federal Government of these multipurpose projects, which includes irrigation, flood control facilities and recreation, would remain under Federal control.

Senator ABDNOR. I see. We could always bank on the 170 megawatts then. Is that your understanding, too, Mr. Clagett?

Mr. CLAGETT. Senator, I would expect that that is one of the many, many things that we would have to address in this effort.

Senator ABDNOR. That isn't apt to change, and that bothers me. My people felt a pretty strong commitment. I don't know what we could have done to stop you from building the dams, but so far, we have seen darn little benefits. Most of the power we produce goes out of the State. We do not have enough public power, I guess. We are at the small end of all the States getting the power out of it; we are the ones holding back all the water to keep people from flooding downstream. We lost our recreation grounds holding back water.

There was a commitment: along with some irrigation, we were going to reserve 170 megawatts for our irrigation some day. These are the things we would have to renegotiate again in the event something like this would happen. Do you think we are going to have to do that, or is the understanding there and will it remain that way? In other words, this power will be available for irrigation regardless of what happens with the sale?

Mr. CLAGETT. Senator, that is one of the many obligations we have, and I would expect under the guidelines we have that that obligation would be preserved.

INCREASED ELECTRICITY RATES

Senator ABDNOR. I would certainly hope so. I guess I have some questions, ones that got away from us, about how much control we would have over it. I guess the only other thing I am going to say, and I hope it is not a live issue at this time; I am going to do everything I can to make sure it isn't.

But I would hate to think the first time, Mr. Chairman, our farmers are finally getting a break out our way with fuel costs coming down a bit. I know it doesn't speak well for the petroleum companies, but there is one group that is getting a tremendous break—the elderly and the farmers who are broke. I don't think anyone questions that any more. We used to come in here and complain, and people didn't really realize the plight of the farmer. Now I think they do. We gave them a little breathing room. Now all of a sudden we are talking about selling this power to the private sector.

I think the Senator from North Dakota mentioned the difference in the prices, what the extra costs would be. This is not the time for something like that. We are having trouble in the Federal Government with our financial problems, but I will tell you, rural America has really got them, and this is not the time to put them in a worse strait than they are today.

Thank you.

Chairman HATFIELD. I thank the Senator.

Senator, I think from time to time that an issue like this is helpful in focusing a review of our philosophy, and so it is a good philosophical expression, and it also teaches us to appreciate, perhaps, more specifically what we presently have and recommit ourselves to those values like the Constitution, PMA's, and other such important documents that brought our country into progress. [Laughter.]

Senator BURDICK. Mr. Chairman, can I have an addendum to my question?

Chairman HATFIELD. Yes, you may.

DEFEDERALIZATION OF PMA'S

Senator BURDICK. Miss Fitzpatrick, for clarification, will the administration pursue negotiations or discussions or initiate any activities for the defederalization or the privatization of the PMA's prior to the grant of legislative authority?

Miss FITZPATRICK. There are activities that we are initiating now which, basically will delineate the issues, some of which have been raised here today. We are trying to identify issues and see what possible solutions might be.

But as I said, there will be no action taken, no change of status of any PMA without legislative authority.

Senator BURDICK. But you are burning the midnight oil and trying to find a way and means to do what you suggested a while ago?

Mr. Fitzpatrick. We are trying to find what the answers will be to the questions that are being asked here.

Senator BURDICK. You could save a lot of money and a lot of time if you just forgot about it. [Laughter.]

Chairman HATFIELD. That is getting to the bottom line pretty fast.

Senator BURDICK. That is all. Thank you.

Chairman HATFIELD. Again, Madam Secretary, you have really been a great witness. We have enjoyed having you here.

Miss FITZPATRICK. Thank you.

BONNEVILLE POWER ADMINISTRATION

STATEMENT OF PETER T. JOHNSON, ADMINISTRATOR

Chairman HATFIELD. I think I will reserve myself on the calling of the PMA directors and go by seniority, remembering that we follow that procedure assiduously around the Senate, and invite the most senior by age of the Act rather than the age of the Administrator.

The Director of the Bonneville Power Administration, Mr. Johnson?

Mr. JOHNSON. Thank you, Mr. Chairman.

My complete statement has been submitted for the record.

Chairman HATFIELD. It will be placed in the record in full, and you may summarize or highlight as you wish.

Mr. JOHNSON. I will be very brief and would be happy to answer questions afterward.

FINANCIAL STATUS OF BPA

Looking back over the last 5 years, about how long I have been the Administrator of Bonneville, I remember the encouragement given by your committee and its members to Bonneville to take the actions necessary to bring Bonneville into better fiscal health where it could, in fact, meet its obligations to the U.S. Treasury.

We have taken a number of actions, most particularly looking at ways by which we could hold costs and improve efficiencies. As a result, in 1984 we made all of our planned payments to the U.S. Treasury, and that summed up to about $650 million. In fiscal year 1985, we again made all of our payments, including interest and amortization, to the U.S. Treasury. These payments totaled about $686 million.

We face, however, not unlike in the past, a dynamic future. Just recently, as I am sure members of the committee are aware, prices for gas and oil have fallen in California, which is one of the big markets for Bonneville. So we are presently underrunning the anticipated revenues from the sale of our nonfirm energy exported into California.

The aluminum companies which located in the Northwest now represent 25 percent of our load. These companies continue to face depressed world prices for aluminum. We still, however, because of cost efficiencies and tight fiscal management, feel very confident that in fiscal year 1986, we once again are going to be successful in meeting all our payments to the U.S. Treasury and can make our planned amortization payment. That will total some $670 million this year.

In conclusion, we see two major objectives—a lot of others, as well—but two major objectives as we look at 1987 and beyond. One is to continue honoring our obligations to the U.S. Treasury, as we have in these last 3 years. The second is, in this volatile market I have described, to continue to provide rate stability and predictability in the Pacific Northwest in order to assist in revitalization of what has been a very weak economy.

Mr. Chairman, that completes my comments. I would be glad to answer questions that you or other Senators may have.

Thank you.

[The statement follows:]

STATEMENT OF PETER T. JOHNSON, ADMINISTRATOR, BONNEVILLE POWER ADMINISTRATION

Mr. Chairman and Members of the Committee. It is a pleasure to come before you today to present Bonneville Power Administration's FY 1987 Budget.

BPA'S DYNAMIC ENVIRONMENT

BPA was created on August 20, 1937, by the Bonneville Project Act. FY 1987 will mark 50 years of providing low-cost, reliable electric service to the Pacific Northwest. I am pleased to tell you that BPA nears its 50th anniversary healthy and unwaivering in its commitment to pursue its mission with efficiency and professionalism.

But these are dynamic times. The effect of the recent collapse of gas and oil rices on our California markets and continuing uncertainty regarding the future of the aluminum industry are just two of the challenges that face us as a utility. As a Federal agency, we are also facing potential change--both in terms of ownership and in the way we repay the Federal investment in the Pacific Northwest power system.

The President's FY 1987 budget calls for legislation that would transfer BPA's transmission system and the related power generation now operated by the Corps of Engineers and the Bureau of Reclamation to non-Federal ownership or control. The budget proposal assumes that defederalization will not take effect until the beginning of FY 1988, to allow time to work out numerous implementation issues. The budget proposal further assumes that BPA would be sold at a price equal to the unpaid Federal investment--approximately $8.85 billion. I want to emphasize that these are assumptions for budget purposes only. A proposed sale price and date of transfer will be developed following an extensive public review process.

Through that process the administration will seek the views of various concerned groups and individuals. A task force is currently developing a detailed work plan to move ahead with this process. There are many complex questions that must be raised and dealt with as we move forward, and we will be active participants in the evaluation of how the agency might be restructured.

Although the budget assumes that BPA will be sold to non-Federal interests, in the interim the budget also calls for legislation changing the way BPA repays the Treasury for the Federal investment in the Northwest power system. The revision would put BPA on a fixed, straight-line amortization schedule for each power investment financed by appropriations. This proposal would add $139 million to BPA's FY 1987 Treasury payment of approximately $654 million, and would increase annual Treasury payments by between $111 and $115 million in subsequent years. We are looking closely at the impact this increase would have on our rates, and on our FY 1987 revenue requirement.

FISCAL SUMMARY

During FY 1985 strong fiscal management paid off for BPA. Although our revenues underran projections, a combination of underruns in fixed costs and effective management of controllable costs allowed us to carry out our program and more than meet our Treasury payment target by transferring approximately $686 million to the Treasury. This final audited figure is approximately $16 million more than the preliminary estimates which are shown in the budget. This total includes approximately $237 million in amortization payments for investments by the Corps of Engineers, Bureau of Reclamation, and BPA, and $366 million for interest payments.

On July 1, 1985, new rates went into effect that will be in place for a 27-month period covering all of FY 1986 and FY 1987. An increase of only one percent in priority firm rates provided much needed rate stability to the region, after dramatic increases since the mid-seventies.

Bonneville's FY 1986 revenues are being adversely affected by such forces as lower than normal rainfall last fall, the plight of the aluminum industry, and the impact of falling gas and oil prices on sales of surplus energy outside the region. This combination of forces poses a very real threat to meeting our FY 1986 revenue requirements and represent a distinct management challenge. As yet, we are unable to predict the outcome. However, we are closely monitoring costs, and still plan to meet our $670 million Treasury payment in FY 1986.

We are supporting Federal deficit reduction goals. Treasury borrowing for Bonneville's FY 1986 capital program is being held to $330 million, and a reduction of almost $2.5 million has been applied to our FY 1986 administrative expenses under the sequestration procedures of the Gramm-Rudman-Hollings Act.

Because of our continuing commitment to controlling costs, BPA's FY 1987 current services budget, at $2.9 billion, is less than one half of one percent--just $13 million--higher than our FY 1986 budget. BPA's rates were set through FY 1987 in the 1985 rate proceeding. It is too early to assess how recent events may impact our FY 1987 fiscal situation. We could, however, experience revenue shortfall due to the softness of California markets caused by the drop in oil and gas prices.

During FY 1987 we plan to borrow $276.1 million from the Treasury for transmission system planning and construction, energy conservation, and mitigation of the impacts on fish and wildlife of the Federal Columbia River Power System. Under the current services budget, our planned Treasury payments include $410 million in interest, and $149 million for amortization. At the end of FY 1987 BPA will have retired over $1.2 billion of the Federal investment, and will have paid a cumulative $4.2 billion in interest.

Before I describe BPA's FY 1987 program to you in more detail, I would like to discuss some of our recent achievements.

DIRECT SERVICE INDUSTRIES

Depressed world market prices for aluminum continue to create financial problems for most Northwest aluminum companies. This is of concern to the entire region because a healthy Pacific Northwest aluminum industry helps keep power rates more stable for all BPA customers. Although the recent spot market price for aluminum ingot has risen from a low of about 43 cents per pound to about 59 cents per pound, it remains significantly below both historical ingot price levels and long run unit costs of most plants in the region. During 1985 we offered temporary discounts to BPA's direct service industrial customers (the DSI's). These discounts were made available only under circumstances which would maintain BPA's total revenues and planned Treasury payments.

These were short-term solutions. We are now undertaking actions to assure long-term stability. Following the 1985 rate proceedings we conducted a DSI Options Study to seek solutions to problems associated with the instability of DSI loads.

Based on the results of the study and on an extensive public process, we are focusing on three proposals. The first, a variable rate proposal, would offer aluminum companies a power rate that would fluctuate with changes in the market price for aluminum. We are studying a second rate proposal that would create a long-term link between DSI and preference customer rates. Finally, we are looking at joint-sponsorship of modernization programs at the region's aluminum smelters to achieve greater efficiencies in their consumption of electric energy.

SUPPLY SYSTEM

BPA recently reexamined its resource plans for the FY 1988 through FY 1992 time period in its 1986 Resource Strategy. The Strategy, which was just finalized, concluded that the probability of there being a need to restart construction of Supply System Projects 1 and 3 (WNP-1 and WNP-3) through

FY 1992 was not great enough to warrant the inclusion of construction restart costs in the outyear estimates of our FY 1987 budget. Net reductions in outyear estimates of as much as $140 million from the levels contained in our FY 1986 budget reflect the decrease in debt service requirements associated with deferring construction beyond FY 1991.

Another very important achievement during FY 1985 was the settlement of a lawsuit brought against BPA for delaying construction of WNP-3 in May 1983. BPA and the four investor-owned utilities, which owned 30 percent of WNP-3, reached an agreement in September 1985. Damages stemming from the suit, if successful, could have amounted to more than $2 billion.

WNP-2 became operational in December 1984. During FY 1985, the plant's capacity factor was 54 percent. This was down from the planned 70 percent plant factor, primarily because of the delay in commercial operation from July 1984 to December 1984, as well as recirculation pump problems the project had. Nevertheless, the plant's power made a significant contribution to BPA's revenues during a period of poor hydro conditions.

THE FY 1987 BUDGET

FY 1987 budget levels under both current services and the modified repayment proposal are compared below with the FY 1986 current services program. A short discussion of the more substantive current services program plans for FY 1987 is also provided.

PROGRAM	FY 1986	FY 1987 Current Svcs.	 Repymt. Prop.
		(in thousands	of dollars)
Resource Planning, Acquisition, and Oversight	967,300	955,900	955,900
Residential Exchange	1,084,200	1,109,600	1,109,600
Energy Conservation	106,800	117,500	117,500
System Planning and Construction	249,900	187,100	187,100
Operating Programs	166,900	187,100	187,100
Reimbursable	47,400	48,700	48,700
Interest	188,900	211,300	194,600
Associated Project Costs	114,200	121,700	143,500
Total Program Obligations	2,925,600	2,938,900	2,944,000
Capital Transfers	367,000	321,100	455,400

RESOURCE PLANNING, ACQUISITION, AND OVERSIGHT

The resource planning, acquisition, and oversight program remains relatively stable, reflecting current forecasts of a substantial energy surplus until the mid to late 1990's. Consistent with it's Resource Strategy, BPA is developing programs which provide a capability to meet an unexpectedly rapid load growth without prematurely committing BPA to costly, large-scale resource acquisitions.

The slight decrease in this program area between FY 1986 and FY 1987 reflects a reduction in WNP-2's expenditures as construction contracts are closed out. FY 1989 through FY 1991 budget estimates for WNP-1 and WNP-3 have been reduced to reflect deferred construction of those plants beyond FY 1991, consistent with the 1986 Resource Strategy.

RESIDENTIAL EXCHANGE

The budget includes about $1.1 billion for the residential energy exchange program created by the Pacific Northwest Power Act. The exchange program provides rate relief to homes and small farms served by about 25 utilities. Approximately 80 percent of the $1.1 billion will be recovered from these utilities. The balance, $228.6 million, will be paid by BPA's other ratepayers. The increase from FY 1986 to FY 1987 in exchange costs is due to a combination of four factors: increases in utilities' average system costs, load growth, new utilities entering the exchange, and the level of BPA's own rates.

CONSERVATION

Funding of $117.5 million is projected for Bonneville's conservation program in FY 1987. In formulating the FY 1987 program, BPA took into account its revised load forecast and the Northwest Power Planning Council's 1986 Power Plan. Emphasis continues to shift toward development of the capability to acquire savings in the non-residential sectors of electricity use.

BPA's funding requirement for residential conservation programs will be reduced to an estimated $56.2 million in FY 1987, while funding for commercial and industrial programs will increase to $47.3 million in areas believed to have high savings potential in the Pacific Northwest. A $10.9 million increase over FY 1986 in programs for public agencies and other customers is almost entirely devoted to initial implementation of Model Conservation Standards (MCS) in new residential and commercial structures. MCS efficiencies, if not captured in initial design and construction, are lost to the region as opportunities for cost-effective savings.

As BPA has gained experience in the accomplishment of conservation, its performance against budget targets has become more predictable. During FY 1985 BPA completed 95 percent of the planned program we described to you a year ago.

SYSTEM PLANNING AND CONSTRUCTION

BPA's system planning and construction program funding is projected at $187.1 million. This amount includes $57.0 million for continued construction of facilities initiated in prior years, $120.9 million for "new start" additions to the power system and the replacement of aging and obsolete power system equipment, and $16.3 million for research and development in electric power transmission and BPA's EPRI contribution.

A major FY 1987 new start is the addition of reinforcements to BPA's system to support construction of a Third AC Intertie between the Pacific Northwest and the Pacific Southwest. These reinforcements will increase interregional AC capacity by 1600 megawatts. Progress has been made, but much work remains to be done. Nevertheless, unless utilities in the Northwest and Southwest, including BPA, determine that this project is economically feasible, construction will not begin. Long term oil and gas prices will certainly figure in this evaluation.

FISH AND WILDLIFE

BPA's FY 1987 fish and wildlife program will be funded at $44.2 million, $10 million more than in FY 1986. This program level reflects the maturity of BPA's role in achieving the fish and wildlife objectives of the Pacific Northwest Power Act and our commitment to supporting the Planning Council's Fish and Wildlife Program.

OTHER PROGRAMS

BPA's other program areas show little change, with minor increases mainly due to inflation and increased interest costs. Despite constrained funding and manpower levels in recent years, BPA is internationally respected in the utility industry for the efficient and reliable operation, maintenance, and scheduling of its extensive power grid.

CONCLUSION

BPA has come through a period of great turmoil. We have resolved many difficult issues and are entering a period of hard-earned stability. Because BPA plays a critical role in the revitalization of the Northwest economy, we must proceed agressively to meet the challenges ahead.

Our power resources appear to be more than adequate to meet regional needs for the decade, but we are now faced with effectively marketing the surplus in a time of dropping oil and gas prices. This is a challenge in which BPA has a great financial stake.

Recognizing a common energy destiny, we have developed strong working relations with utilities outside our region. In the future we will continue to plan cooperatively for an efficient use of Canadian and Pacific Northwest resources that will benefit the Northwest, Canada, and California.

Most importantly, we have achieved stable rates and become a lean, efficient organization. In the year ahead we will continue to work to stabilize our revenues, so that BPA can meet its repayment obligations to the Treasury.

This concludes my prepared statement. I will be glad to answer any questions you might have.

BIOGRAPHICAL SKETCH

PETER T. JOHNSON
Bonneville Power Administrator

PETER T. JOHNSON was born in Boise, Idaho in 1932. He received a Bachelor's Degree from Dartmouth College in 1954. The following year he was awarded a Master's Degree in Business Administration from Amos Tuck School of Business in Dartmouth. He completed his military service as a Contracting Officer in the U.S. Air Force and served in the Idaho Air National Guard.

From 1957 to 1968, Mr. Johnson worked for the MacGregor Triangle Company of Boise, a firm specializing in heavy highway and utility construction. He was elected a Director and Executive Vice President of the company in 1964.

In 1968, he joined Trus-Joist Corp., an international firm manufacturing roof and floor structural systems. He rose to President of the firm in 1971 and Chief Executive Officer in 1975, overseeing the operations of the company during a period of dynamic growth.

Mr. Johnson became a private business consultant in 1979. He co-chaired a Governor's Management Task Force in Idaho during 1980, seeking ways to improve the efficiency and productivity of state government. He also was a member of President Reagan's Transition Team in 1980-81.

In May 1981, Mr. Johnson was appointed Bonneville Power Administrator by the Secretary of Energy. Bonneville Power Administration is an arm of the U.S. Department of Energy.

As Adminstrator, Mr. Johnson is responsible for overseeing all activities of the Federal power marketing agency, including operation of one of the world's largest high-voltage transmision systems. He directs the making of policy for BPA and guides Bonneville's efforts to implement the Pacific Northwest Electric Power Planning and Conservation Act.

The Administrator is ultimately responsible for decisions on acquisition of cost-effective power resources by BPA to serve the needs of the region. The Act gave BPA the mandate to acquire electric resources, giving conservation and renewable resources priority over conventional generating resources.

He serves on the U.S. Committee of the World Energy Conference, the Board of Directors of the Electric Power Research Institute, and is Chairman of the United States Entity under the Columbia River Treaty with Canada.

Chairman HATFIELD. I thank you, Mr. Johnson.

Does the Senator from South Dakota have any questions?

Senator Abdnor. No.

Chairman HATFIELD. Does the Senator from North Dakota have any questions?

Senator BURDICK. No.

BRITISH COLUMBIA HYDROPOWER SALES

Chairman HATFIELD. Mr. Johnson, I have here an article written by Mr. James Flannagan of the Oregonian in which the headline reads, "BPA Bar To BC Power Sale." That is British Columbia, as you know. In that, I note that the Canadian Ambassador of the United States, a friend of mine, Mr. Alan Gotleib, was quoted in this article as stating that the BPA was "A bar to the sale of power between Canada and California."

Would you please comment on that quote attributed to the Canadian Ambassador?

Mr. JOHNSON. Thank you, Mr. Chairman.

And with all due respect to the Ambassador, I have to disagree. I don't think that Bonneville in any sense has been a bar to the success of the program of British Columbia Hydro, to market its surplus power into the Pacific Northwest or California. In fact, rather than a bar, I think Bonneville serves as the grease on the wheel. In 1984, we adopted an access policy which gave first priority to surplus utilities in the Pacific Northwest on a pro rata basis, but this has not adversely affected British Columbia Hydro.

Let me explain. In looking at 1984 and 1985, British Columbia Hydro export revenue records, we find that they have sold all of the surplus they have generated in their system in the 9 months ending on December 1, 1985. They sold $218 million, up from $69 million just 3 years before, a threefold increase in revenues from export energy, surplus energy. This represents some 18 percent of the total generation utility revenues of British Columbia Hydro.

In 1985—I think this is very significant—we hear about the success of exports from Canada and imports into the Northeast or Northeastern United States. In 1985, British Columbia Hydro exported 10,300 gigawatt-hours. That was the largest amount exported by any Canadian utility in the calendar year ended December 31, 1985. They were the largest exporter of Canadian power.

This success can be laid, in part, to a good water year this last year, and that was important to both of our systems. However, equally important, and this is what I think we have to point out, in keeping with a long-standing relationship of cooperation between the Pacific Northwest and Canada, Bonneville Power Administration, with the schedulers of British Columbia Hydro, encouraged the shaping of this surplus power into windows, those times when capability was available on Bonneville's intertie in order that they could, then, access those opportunities and market power into the Northwest and into California.

Also, we were particularly imaginative in our application in our use of treaty and nontreaty storage to enable British Columbia Hydro to receive interconnection ratings from time to time. This was, again, because of cooperation between the two systems. Finally, other creative flexibility and contract interpretation and new operating arrangements also helped British Columbia achieve this record year in export of power.

So, I beg to differ with the good Ambassador in his conclusion, because I don't think that the circumstances bear out that allegation. In fact, Bonneville was the grease on the wheel, as I say, for the export policies and strategies of British Columbia Hydro in the last several years.

Chairman HATFIELD. Mr. Johnson, just to sort of go back and pick up a couple of pieces on this, is it not true, as I understand the situation, that BPA owns, in effect, or controls the only interconnection between British Columbia Hydro and the United States as far as exports of power into the United States is concerned?

Mr. JOHNSON. Largely, yes. There is an ownership by Portland General Electric and Bonneville in the southern portion of the intertie, but the northern portion of the intertie is owned and controlled by Bonneville.

Chairman HATFIELD. It is not as if they have alternative systems through which they could export their power. They really are basically dependent upon that kind of access to export their power to the United States?

Mr. JOHNSON. At this time; yes.

Chairman HATFIELD. Then you are saying that you have been working to facilitate those hydro exports during this period of time when there has been a record high export by British Columbia over any other exporting systems in the whole country of Canada?

Mr. JOHNSON. That is correct.

BRITISH COLUMBIA FUTURE POWER INVESTMENTS

Chairman HATFIELD. Let me take that one step further. I understand also, Mr. Johnson, that British Columbia is planning to invest in new resources, additional resources for what would be called long-term export, and that at the present time, British Columbia is expecting to again transmit those new power developments through the BPA transmission lines; is that correct?

Mr. JOHNSON. That is correct.

Chairman HATFIELD. In other words, they have so much confidence in the future, based upon their current record, that they are going to invest in expansion and on transmission lines, by the way, which I might just gratuitously add, which are paid for by the Northwest ratepayers.

How far down the road is British Columbia in completing this new, long-term power development that will utilize BPA transmission lines for export to the United States?

SITE C RESOURCE DEVELOPMENT

Mr. JOHNSON. Mr. Chairman, it was in August of last year that Premier Bennett announced that it was his plan to build site C on the Peace River in Canada. He had reasons for doing this, but that was the first announcement that a sale of major resource would be made over a long-term period of time, up to 20, 25 years. Bonneville and other Northwest utilities, public and private, sent a letter to the Premier and to the chairman of British Columbia Hydro expressing an interest in that. We felt that this was creative, and we wanted to have an opportunity to assess the possible acquisition of that resource or participation in it.

We have commenced discussions with Canada and also with utilities in California and with utilities, public and private, in the Pacific Northwest. We have had many meetings beginning in late fall last year and continuing up through the present. We have been attempting to bring parties together to assess this opportunity. Through the pursuit of common interests, we can find benefits that then can be shared through not only the Pacific Northwest and Canada, but in California, as well. We have made it abundantly clear that there are certain actions that would be required precedent to this outcome.

This great success in the exporting of existing surpluses is within the framework of existing intertie capacity. So these are the conditions that we have advised the parties must be agreed upon before any consideration can be given to exporting a new major resource through the Pacific Northwest into California: First, that the intertie capacity between the Pacific Northwest and the Pacific Southwest must be increased to 7,900 megawatts, including completion of the third ac California transmission project. Development of that project has been ongoing, now, for the better part of 2 years, and it is advancing at this time.

The second condition is that contracts must be executed between Bonneville and other Northwest utilities and California utilities having an interest in the third ac California transmission project.

Third, environmental analysis pertaining to intertie development and long-term intertie access policy must be completed. Fourth, Bonneville's interest with regard to certain obligations must be preserved. In other words, if there, in fact, is going to be a firm path granted across the Pacific Northwest between Canada and California, we must first be assured that Bonneville's ability to repay its obligations to the U.S. Treasury are not impaired, that Bonneville is protected from adverse impacts on other ratepayers of systems served by Bonneville; and finally, the operation and planning in the Federal Columbia River power system, pursuant to applicable law, is conducted in an economic and efficient manner.

BRITISH COLUMBIA POWER EXPORTS

Chairman HATFIELD. Mr. Johnson, could I give you my layman's summary of where we are on that and see if I am correct? It appears to me that there has been a rather satisfactory and, I would say, rather successful access up to this point by British Columbia to export power through the BPA transmission system into the United States; that the success of that arrangement has been further demonstrated by a public announcement by the Premier or other officials that there are plans to invest in expansion of resources to continue meeting that market within the United States through the Bonneville transmission lines. Bonneville, in turn, of course, has been involved in developing these transmission interties into California. We have been selling surplus power in that California market, and that has been part of our budgetary program to help make it possible to pay back to the Federal Treasury our investment in generation and transmission facilities and you have given the status of your repayment in your statement.

Now, as I understand the picture, then, there would be, in effect, a type of preference given for the continuation of selling any Northwestern power, surplus power, into the California market, but there certainly would not be any bar to the acceptance of additional Canadian power over those transmission lines. But if the market becomes saturated, which I doubt very much it will be in terms of building that second intertie into California, then and only then would there be some slowdown in any export from British Columbia into the American market, because that market is being saturated or being provided by the surplus within the Northwestern United States.

Is that an accurate description of the situation where we are as far as British Columbia is concerned and their future long-term development and resources?

Mr. JOHNSON. Mr. Chairman, I think that is a fair summary of where we stand at the present. The present existing intertie capacity is being effectively and efficiently utilized, not only by our own sources, but as I said, those in Canada, with existing operating resources. If there are to be existing resources built like site C, we must have additional capability.

MARKETING COOPERATION

Chairman HATFIELD. Then I come back to a puzzle, I guess. Could you speculate a bit as to why the Canadian Ambassador to the United States would, if quoted correctly, would at least imply, if not explicitly state, that there was somehow a sort of a threat here or at least a lack of cooperation in the ability of British Columbia to export its power based upon your statement here today and the record of that exporting that has been going on and that which could be planned for the future? I am puzzled as to why the Ambassador would make this kind of statement. Can you explain this?

Mr. JOHNSON. I don't think I can put myself in his shoes. I would, perhaps, suggest that he is looking through the eyes of and the province of British Columbia and its Premier, Premier Bennett, who is very anxious to stimulate the economy and create jobs in this work project, site C, that would be built ahead of need. They would need transportation to get to the U.S. border, but they don't have any control over how the power would be handled south of that. It might be a signal to our friends in California that, "We would like to make the sale, and if additional transference is necessary, that would be a call we could make in the Northwest, as we certainly have." But our friends in California would have to recognize and appreciate this, as well.

Chairman HATFIELD. Then you would say you are not standing in the way and the record and statistics would prove that the Bonneville Power Administration is no bar to the exporting program of British Columbia?

Mr. JOHNSON. No; I think all anyone would have to do is look at the facts.

Chairman HATFIELD. After that great international incident, we will move along to our next witness [Laughter.]

ADDITIONAL QUESTIONS FOR THE RECORD

Thank you, Mr. Johnson.

Additional questions will be submitted to you for the record. If you could respond to those as quickly as possible, it would be most helpful.

[The questions and answers follow:]

QUESTIONS SUBMITTED BY CHAIRMAN HATFIELD

WPPSS - Supply System

Question: Although rates now are stabilizing, in your testimony last year, you indicated that rates are 600 percent more than in 1979. How much of the increase is attributable to WPPSS? What percent?

Answer: WPPSS costs are recovered from the Priority Firm (PF) rate which has increased about 500 percent above its 1979 level. WPPSS costs currently represent about 65 percent of BPA's Federal Base System resource costs. Nearly all of this amount has been added to BPA's costs since 1979. After accounting for other costs, such as transmission and the residential exchange, the increase in WPPSS costs account for about 50 percent of the increase in the PF rate between 1979 and the present.

Question: Both WPPSS 1 and WPPSS 3 have been delayed, and your Resource Strategy indicates that the possibility of construction restart through 1992 appears less likely. What conditions have changed to warrant this modified view?

Answer: There are two reasons for this modified view concerning the construction restart date. First, the 1986 Resource Strategy used July 1985 load projections for the region which show a decline in both the medium and low long-term forecasts from those shown in the 1985 Resource Strategy. Second, there is an increased uncertainity that the forecasted loads will actually occur. The uncertainity of these loads is reflected in the larger spread between the high and low forecasts.

Question: With regard to WPPSS 3, BPA has a 70% interest and recently entered into an out-of-court settlement. Please briefly describe the settlement and what impact it will have on the potential restart of WPPSS 3.

Answer: The settlement accomplishes several objectives. It avoids adverse effects on other BPA customers, minimizes rate impacts, avoids influencing restart or termination of WNP-3 construction, requires minimal commitment of BPA's nonfirm energy resources, avoids any requirement that BPA acquire a resource, and shares appropriately the risks involved with operating a nuclear plant.

BPA's responsibilities under the settlement agreement are:

- To provide the private utilities with electric power equivalent to the capability associated with their share of the investment in WNP-3 to date;

- To begin providing the power on January 1, 1987, the estimated date WNP-3 would have begun producing energy if it had been completed on its last construction schedule prior to the delay;

- To pay the variable operation and maintenance (O&M) cost of the private utilities' combustion turbine when the energy is delivered to BPA;
- To reimburse the utilities for the cost of preserving their share of WNP-3 after February 1, 1985;
- To acquire under the Pacific Northwest Power Act the utilities' share of WNP-3 before restarting construction.

The settlement agreement requires the four private utilities to do the following:

- To irrevocably offer the project capability from the utilities' share of WNP-3 for sale to BPA;
- To provide BPA the right to request energy from each utility's combustion turbines or other available lower cost resources in an amount equal to the power BPA delivers to the utilities;
- To pay to BPA an amount which will approximate the amount they would have paid for O&M costs if WNP-3 had been operating;
- To agree to arrange financing for the remainder of their share of WNP-3, provided BPA acquires the utilities' remaining share in the project.

This settlement is not expected to have any direct impact on the decision to restart or terminate construction of WNP-3.

Question: How much will be spent in FY 87 on debt service for WPPSS 1 WPPSS 3?

Answer: Debt service for WNP-1 will run $206.7 million in FY 1987. For WNP-3, it will total $163.5 million.

Question: How much is spent for each plant on preservation costs in FY 87?

Answer: Preservation costs for WNP-3 will be $22.2 million in the FY 1987 Budget. Preservation costs for WNP-1 are $21.5 million. WNP-1 preservation costs are not included in BPA's budgets because they are currently being paid by the Supply System from construction bond sale proceeds. Preservation levels are presently being discussed in the region and are subject to change during the Supply System's annual budget review processes. The Supply System's 1987 budget formulation process (covering July 1986 to June 1987) is now nearly complete.

Question: For the record, provide a breakdown for each plant on the debt service and "preservation" costs in FY 85, 86, and 87 with a statement of justification for each activity. Please provide an estimate, if possible, of these two costs for FY 88 thru 1992.

Answer: The table below shows debt service and preservation costs for WNP-1 and WNP-3 through FY 1991. Preservation costs, in particular, are subject to scrutiny and change during the Supply System's present budget approval process. Estimates of debt service and preservation costs for FY 1992 are not available and are being developed now for the FY 1988 Budget.

WNP-1 and WNP-3 Debt Service and Preservation Costs
(in millions of dollars)

	FY 1985		FY 1986		FY 1987	
	WNP-1	WNP-3	WNP-1	WNP-3	WNP-1	WNP-3
Debt Service	194.0	154.0	207.1	161.5	206.7	163.5
Preservation	---	28.0	---	27.0	---	22.2

	FY 1988		FY 1989	
	WNP-1	WNP-3	WNP-1	WNP-3
Debt Service	212.8	163.1	212.8	163.1
Preservation	---	26.0	---	23.0

	FY 1990		FY 1991	
	WNP-1	WNP-3	WNP-1	WNP-3
Debt Service	213.6	163.1	214.6	163.1
Preservation	---	23.0	---	25.0

WNP-1 preservation costs will be paid through at least FY 1990 by the Supply System with funds it has on hand from bond sales made prior to the construction delay. Therefore, those preservation costs are not included in BPA's budgets and are not shown in this table. However, during its FY 1985 (July 1984 to June 1985), the Supply System disbursed $38.4 million from bond sale proceeds for WNP-1 preservation. The Supply System estimates preservation disbursements for WNP-1 of approximately $24.5 million and $21.5 million during its FY 1986 and FY 1987, respectively.

The table shows only BPA's share (70%) of WNP-3 preservation costs. BPA records its obligations for the Supply System on the basis of power transactions. That is, BPA does not account for these obligations using such cost categories as debt service and preservation. However, using Supply System accounting and forecasting information, BPA can approximate how much of its total obligations for WNP-3 were due to Supply System preservation costs in 1985.

Debt service is paid as a result of contractual arrangements with the Supply System, participant utilities and bond holders. BPA funds the Supply System's cash requirements for debt service through net billing. WNP-1 and WNP-3 construction preservation activities are budgeted at a level appropriate to preserve the assets for cost-effective construction restart when BPA determines that the power is needed and financing is available. BPA's FY 1987 Budget assumes that construction on WNP-3 and WNP-1 will resume no earlier than 1992.

Question: When will the review of the potential restart or termination of WPPSS 1 and WPPSS 3 be completed?

Answer: The current analysis of WNP-1 and WNP-3 will be linked to the 1987 Resource Strategy. This will provide adequate time to conduct a thorough analysis and permits the evaluation of an integrated mix of resources. Current plans call for the draft 1987 Resource Strategy to be issued in November 1986.

Question: What is the latest analysis on the option of termination of one or both plants?

Answer: The last published BPA analysis which specifically examined the termination alternative was completed in November 1984. The conclusion, at that time, was that the plants had more value as options to the region than if they were terminated. Subsequent analyses on related issues conducted by BPA and the Northwest Power Planning Council continues to support this conclusion.

Question: What action will be taken if one plant is ranked ahead of the other plant?

Answer: The Supply System has begun the process of "packaging" design work and demobilizing the design teams of WNP-1 and WNP-3 such that they will be at a minimum level of preservation by the end of its FY 1988. A restart of construction will not occur before 1992. At such time as the power is needed and financing is available, the issue of which plant to complete first will be addressed.

Conservation

Question: Are the conservation program levels in BPA's FY 1987 budget consistent with BPA's current rate case proposal and the BPA Resource Strategy?

Answer: BPA's current rates are designed to cover the revenue requirement associated with a $165 million conservation program in FY 1987. This is the level identified in the 1985 Resource Strategy, published in November 1984. In May 1985, our estimate of what it would take to satisfy the Northwest Power Planning Council's Conservation and Electric Power Plan and to accomplish our own Strategy objectives had been revised downward to about $135 million. This level is reflected in our 1986 Resource Strategy. The 1987 Budget level includes an undistributed reduction of $22 million.

Question: Are the out-years for conservation consistent with the Resource Strategy? How do reductions in conservation investment affect the long-term cost of providing power for the Northwest?

Answer: The out-year funding levels for conservation that would be consistent with BPA's recently published 1986 Resource Strategy are $144 million in FY 1988, $160 million in FY 1989,

$171 million in FY 1990, and $183 million in FY 1991. These are nominal dollars, escalated for inflation, and represent a steady overall activity level in the program. BPA's Resource Strategy analysis discusses the expected impacts of investing in conservation at these levels.

Question: The FY 86 budget proposed alternative financing, which to the extent realized, would result in additional conservation achievement. To what extent has alternative financing been applied in the FY 1986 program and in past years? What are the hurdles to greater use of this technique?

Answer: Financial incentives totaling $200,000 involving two industrial sponsor-designed projects have been handled off-budget, as well as $17 million of the Residential Weatherization program. BPA is considering contracts with eight more industrial plants and a number of commercial buildings that will also involve third-party financing. We are also negotiating with several utilities for their use of revenue bonds to finance weatherization.

The primary obstacles to greater use of tax-exempt long-term bonds is the proposed Congressional reform of Federal tax law. Because of this, potential long-term partners in such financing efforts are very leery of entering into the required new arrangements with BPA.

Question: Can BPA carry out the Northwest Power Planning Council's regional electric power and conservation plan under the proposed funding levels for conservation?

Answer: The FY 1986 and FY 1987 amounts in the 1986 Resource Strategy are sufficient to fully implement the Council's Plan. However, the budget amounts are $9 million and $22 million below these levels.

Question: The FY 87 budget proposed a $21.7 million undistributed reduction to conservation activities. What delays or slippage would you foresee in FY 87? How would this reduction be applied among the individual programs? If delays are not identified, what will be the impact of this general reduction?

Answer: The FY 1987 undistributed reduction of $21.7 million will come mainly from the commercial and industrial areas. Preliminary assessments indicate that commercial activities would absorb $12 million, industrial $7 million, and residential about $3 million of the reduction. However, Model Conservation Standards support activities for new homes and commercial buildings are now expected to require greater sums than originally budgeted for FY 1987. This may result in other activities in the residential, commercial and industrial sectors being further reduced as we enter the fiscal year. The extent of these further reductions depends greatly on the penetration of Model Standards construction in new housing--in other words, on the success of our Super GOOD CENTS program which now aims for 30 percent of the market in the 1987 building season.

Transmission

Question: What is the status of BPA intertie planning and construction?

Answer: BPA is currently involved in the planning of two Intertie upgrade projects: the California-Oregon Transmission Project (or Third AC Intertie) and the DC Terminal Expansion Project.

The plan for constructing a new 500-kV transmission line from southern Oregon to California (California-Oregon Transmission Project or Third AC Intertie) as described in the February 7, 1985, Memorandum of Understanding signed by Secretary Hodel, is moving forward.

In California, project participants have signed a Project Development Agreement which provides for up to $27 million for project development work taking the Project to the decision point of whether or not to proceed with construction. A good start on the environmental and power systems studies work has already been made under interim funding arrangements. A preliminary plan of service has been developed and a draft Environmental Impact Statement (EIS) is expected to be published by November 1986. The projected inservice date for the Project is early 1991.

In the Northwest, there are three participating utilities: BPA, Pacific Power & Light, and Portland General Electric. These utilities are currently negotiating an agreement to cover rights and obligations on the expanded intertie on the Northwest. A preliminary Northwest plan of service has been completed. Northwest utilities are also participating in the planning process in California.

A Draft Environmental Report on Northwest Reinforcement Actions will be incorporated as an Appendix of the Draft Environmental Impact Statement (DEIS) and a summary of the report will appear in the body of the DEIS. Both Northwest and California utilities are participating in the Oregon Review Committee established by the State. BPA is also preparing an EIS on Intertie Development and Use (IDU) which examines impacts of changes in system planning and operation in the Northwest and Southwest resulting from planned intertie additions and policies governing use of the Federal Intertie. The ILU-EIS should be released in final form by Fall 1986.

Expansion of the existing Pacific Northwest-Pacific Southwest direct current (DC) intertie (DC Terminal Expansion Project) is also in progress. This project will add 1,100 MW to the DC Intertie's existing 2,000 MW capacity. BPA and the Los Angeles Department of Water and Power (LADWP) will make additions to their respective terminals of the 846-mile line, with no significant new transmission lines needed. Completion in February 1989 is planned.

In October 1985, BPA awarded a $52.7 million contract to Brown Boveri Corp. (BBC) for design, construction, and equipment manufacturing. LADWP awarded a similar $55.1 million contract. Both contracts are divided into two phases. Phase I of these contracts, covering system studies and preliminary design, has begun. The Phase I portion of each contract is limited to $2 million. BPA is conducting further analysis of the effects on hydroelectric operations from utilizing the increased capacity. If the analysis, including analysis on the potential for increased fish mortality, supports a Finding of No Significant Impacts (FONSI), then BPA will supplement the Environmental Assessment issued in February 1985. A FONSI could be in place by July or August 1986 with Phase II of the contract initiated soon thereafter. If a FONSI is not supported, then the start of Phase II would be dependent on the outcome of the analysis in the IDU EIS and subsequent decisions on expansions and any needed mitigation.

Question: What is your view on the economic feasibility of the Third AC Expansion?

Answer: The new Third AC Intertie would appear to be economically feasible to the extent firm contracts can be written for the sale of power and for capacity/energy exchanges which are beneficial to the Pacific Northwest and the Pacific Southwest. These benefits would accrue in addition to the enhanced marketing of economy energy as a result of the Third AC.

Question: Will the Third AC line and the DC upgrade together result in Western Grid Reliability problems without a second DC Intertie to Nevada?

Answer: No, the Third AC line and DC Upgrade (Expansion) together will not result in Western Grid Reliability problems without a second DC Intertie to Nevada. Western Grid reliability is expected to improve with addition of the Third AC line by eliminating a major control action presently required for an outage of the two line AC Intertie system. Design criteria for the DC Expansion Project provides for increased reliability of the DC terminals. Major upgrades to the existing Intertie stability controls will also be completed prior to operation of the DC Expansion Project and will help to insure reliable operation of the Western Grid for both projects.

Question: What is your position on the need for the Second DC Intertie from the Pacific Northwest to the Southwest? What do the preliminary economic studies indicate as to the feasibility and timing of this line.

Answer: The Second DC Intertie would not appear to be economically justified for additional economy energy sales from the Pacific Northwest beyond those of the existing system, plus the Terminal Expansion and Third AC. To the extent seasonal diversity between the Pacific Northwest and the Inland Southwest is feasible, the Second DC would be one alternative to achieve this. Additionally, if the Pacific Northwest or others build ahead of need and can economically defer new generation in the Inland Southwest, then the Second DC again would be investigated. Both of these uses place timing for a Second DC in the late 1990s.

Question: Do you have any concerns over the WAPA's plans for the Manitoba Hydro project, either separately or in conjunction with the DC Intertie, and it's potential impact on BPA revenues or operations?

Answer: To the extent Manitoba power would reach the California Market, we would be concerned about potential impacts to BPA revenues and operations. In the longer time frame, we could be impacted in our ability to market or exchange power with the Inland Southwest. Therefore, we strive to stay abreast of and where possible provide input to programs such as this. We understand that power from the project would not be available for delivery in the United States until the late 1990's.

Fish and Wildlife

Question: For the record, provide estimated funding for the six major capital projects for FY 86, FY 87, and the out-years.

Answer: The following is the estimated funding for the six major capital projects for FY 1986, FY 1987, and the out-years. These projects will be under construction in FY 1987.

Estimated Funding for Six Major Capital Projects
(dollars in thousands)

	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990	FY 1991
Enloe Dam Passage	325	2725	2050	275	--	--
Three Mile Dam Passage	525	2850	--	--	--	--
Umatilla River Steelhead Hatchery	1725	650	--	--	--	--
Nez Perce Capital Facility	325	2025	2050	--	--	--
Yakima Hatchery	825	6100	4050	725	850	--
Colville Hatchery	300	2650	1550	275	--	--

Question: Provide an object class breakdown in FY 85, FY 86 and FY 87 for the fish and wildlife program.

Answer: The following is a object class breakdown for FY 1985, FY 1986, and FY 1987 for the fish and wildlife program.

Object Class Breakdown for FY 1985, FY 1986, and
FY 1987 for Fish and Wildlife Program
(dollars in thousands)

Object Classes	FY 1985	FY 1986	FY 1987
Personnel Compensation & Benefits	800	934	1,590
Travel & Transportation	81	117	156
Miscellaneous Contractual Services	24,140	33,143	42,450
Materials & Supplies	1,122	--	--
Budget Total	26,143	34,194	44,200

Question: How much is allocated for contracts in FY 85, FY 86 and FY 87? List in a table the contract areas and amounts allocated to each.

Answer: The following table reflects the allocated amounts for contracts in FY 1985, FY 1986, and FY 1987.

Contract Allocation for Fish and Wildlife Program
(dollars in thousands)

	FY 1985	FY 1986	FY 1987
	Contract Areas and Amounts		
New Measures	0	0	2,800
Anadromous Fish	19,840	26,743	31,600
Resident Fish	3,400	3,600	4,200
Wildlife	600	2,100	2,400
New Hydro	300	700	700
Miscellaneous Other	---	---	750
Total	24,140	33,143	42,450

Question: Explain the need for $2.8 million for new program measures. What new activities are anticipated?

Answer: When BPA was developing its FY 1987 budget, the Northwest Power Planning Council was concluding amendments to the Columbia River Basin Fish and Wildlife Program. The $2.8 million for new measures in the FY 1987 budget included funding in anticipation of several projects which have since been amended into the program by the Council.

New capital projects being proposed in FY 1987 are: (1) passage improvements at Umatilla River, Oregon, water diversions; and (2) Wildlife land acquisitions in Montana. It is anticipated the remaining funds will be used to evaluate the effectiveness of water budget flows, initiate new studies on fish health and fish hatchery effectiveness, and plan several new habitat enhancement projects.

Question: What is the status of your major policy process on the BPA fish activities under section 4 of the Regional Act?

Answer: BPA has completed and implemented one major fish and wildlife policy (Fish and Wildlife Consultation Policy). There are two policies currently under development and public review. These are a draft Fish and Wildlife Real Property Policy and a draft Fish Passage Spill Policy. There are two policies contempleted for public review later this year. They are the Fish and Wildlife Compensation Policy and a policy development process to determine the extent of the Administrator's obligation to protect, mitigate, and enhance fish and wildlife in the Columbia River Basin.

Load Forecasting

Question: Why is there a need for an increase in funding for load forecasting in FY 87 as compared to FY 86?

Answer: The increase in funding for load forecasting from FY 1986 to FY 1987 allows BPA to continue the evolution of its load forecasting activities that began in 1980. In that year, BPA began development of an independent long-term energy-forecasting capability. In response to subsequent changes in the region's energy environment, we began developing short-term forecasting capability to support our rate and marketing analyses. We also began developing an "hourly" forecasting capability to support our system planning and operation, marketing, and conservation analyses. These forecasts will continue to provide BPA with information critical to maintenance of its competitive position in a changing energy marketplace. Over the period FY 1982 to FY 1986, there has been a continuing shift in emphasis from the long-term forecasting to the short- and midterm forecasting related to BPA's marketing activities.

The proposed funding levels allow for a continuation of BPA's efforts to perform necessary short- and midterm analyses. Only a small portion of the forecasting budget is designed to monitor and incorporate changes in procedures for the traditional long-term energy forecast. Most of the contract budget is focused on the areas of hourly load analyses necessary to the shaping of short- and long-term capacity and energy sales now being discussed both in and out of the region. Other major activities include work with our DSI's and data collection called for in the Planning Council's action plan.

Question: How are your efforts coordinated with those of the Planning Council?

Answer: BPA's forecasting efforts have been closely coordinated with those of the Planning Council in areas of mutual interest. For example, both the BPA and the Planning Council share data and research results provided by staff and consultants; BPA forecasting staff sit on the Planning Council's advisory committees for economics and load forecasts; Council staff sit on BPA's technical advisory committees; and both technical staffs meet on a regular basis to share information.

While there is a great deal of coordination, primarily on long-term forecasting issues, the forecasting efforts are not identical. As indicated, earlier BPA's forecasting efforts have undergone significant changes since 1980 in response to a changing environment. Our short-term forecasts, hourly load shape analyses and small area forecast support have been shared with the Planning Council. The Planning Council has no equivalent activity to coordinate, since it is concerned with long-term forecasts for resource planning only. These differences stem largely from BPA's needs to address the many operational, marketing, rate development, customer service facility planning, and transmission planning activities unique to our agency.

Question: Under current forecasts, with medium load conditions, you indicate that the region will have a substantial surplus until the mid to late 1990's. What are the major assumptions which lead to this forecast and how have these assumptions changed from FY 85? What is the trend in growth in your forecasts over the last 5 years?

Answer: BPA's most recent load forecast was completed in FY 1985 (July 1985), and showed a medium case growth of 1.5 percent per year from 1985 to 2005. High and low ranges were also prepared, with growth rates of 2.9 percent and 0.3 percent, respectively. The medium case assumed continued recovery of both the regional and national economies from the recent recession, with real GNP growing at 2.9 percent from 1985 to 1995 and 2.6 percent from 1995 to 2005. Regional nonagricultural employment was projected to grow at 1.8 percent annually and population at 1.2 percent annually. In addition, real electricity rates to the region's ratepayers were projected to be stable throughout the forecast period. On the resource side, in FY 1985, WNP-1 and WNP-3 were assumed to be available for commercial operation in March 1992, and September 1993, respectively. Currently, they are considered to be secured options and are not a part of surplus estimates. The 1986 annual long-term load-forecasting cycle has just begun, with expected completion in July of this year.

At this time, we do not expect to see major changes in the outlook for the regional economy or loads. This forecast will include the recently adopted Oregon and Washington building codes and the effects of our recently completed 1986 Resource Strategy (WNP-1 and WNP-3 are in a state of suspended construction and were removed from the load resource balance).

In regards to our forecasts over the last five years, the early 1980's saw some rather dramatic reductions in load forecasts as both the real world and forecast methodologies changed. The past two BPA forecasts, prepared in FY 1984 and FY 1985, have shown significant stabilization which we expect to continue this year. Our expectation, at this time, is the new load forecast will continue to recent pattern of load growth stability.

Hydro Options

Question: What is the status of the hydro options program?

Answer: The hydro options test program is approaching option contract negotiations with four small hydro developers from the region. After extensive project evaluation, these four developers were selected as option candidates out of the 16 who responded to a regional solicitation for interested developers. This solicitation opened in late 1984 and closed early in 1985. BPA is completing a final internal review of the test objectives and mechanisms. If BPA decides that conditions are favorable, then contract negotiations will begin. If negotiations with the four developers are successful, then BPA will sign 6-year options contracts. BPA and the developers will then begin a cooperative effort to reach and maintain a state of regulatory readiness. As a result, at any time within a 6-year period, BPA can decide to either exercise the option and purchase the project output or terminate the option.

Question: Provide a full description of any projects selected as option candidates or to receive further consideration.

Answer: The four projects selected as option candidates out of the original 16 responding to the regional solicitation are as follows:

State of Washington

Project: Sullivan Creek Power Project
Developer: Public Utility District No. 1 of Pend Oreille Co., WA.
FERC #: 2225
Location: Pend Oreille County Washington on the Sullivan Creek near Metaline Falls
Capacity: 20 MW
Description: This is an existing nongenerating project for which the developer intends to file with FERC for a license amendment to rebuild the existing dam and add 20 MW of generation.

Project: Johnson Creek Hydroelectric Project
Developer: Public Utility District No. 1 of Lewis County
FERC #: 5950
Location: Lewis County, Washington, on Johnson Creek, a tributary of the Cowlitz River near Packwood
Capacity: 14 MW
Description: This is a run of the river project utilizing a diversion structure to redirect water through a penstock to a small powerhouse

State of Idaho

Project: Riser Creek
Developer: Mr. Dale Van Stone
FERC #: 8251
Location: Bonner County, Idaho along the Northern end of Lake Pend Oreille nearby East Hope
Capacity: .5 MW
Description: This is a high head micro hydro project on an undeveloped site designed to redirect water at a diversion structure, and through a 5000-foot buried penstock to the powerhouse

State of Idaho

Project: Mesa II
Developer: Mesa II, Inc.
FERC #: 8497
Location: Adams County, Idaho on the Weiser River
Capacity: 5 MW
Description: This is a new project utilizing a concrete diversion structure to redirect water through a buried penstock into a powerhouse

Procurement Restrictions

Question: As you know, the fiscal 1986 appropriations act contains a 25 percent price preference on procurement of EHV equipment which is manufactured in the U.S. Assuming these restrictions apply, please list each fiscal 1986 procurement for your agency that has been, or will be, affected by the restriction, and the amount of each procurement. Explain the impact of the restriction on the procurement using both the definition of EHV equipment contained in the Statement of Managers accompanying the Conference Report on H.R. 2959 and the definition contained in the statement on the floor of the Senate during consideration of the Conference Report on H.R. 2050.

Answer: The 25 percent price preference on domestic EHV equipment has not been applied to any BPA procurements. If it was applied, then the following actual or planned procurements would have or may in the future be affected. This list includes items not specifically identified in the Conference Report.

PROCUREMENTS AWARDED AND PLANNED FOR AWARD WITHIN FY 86

Conference Report on H.R. 2959 Definition:

Contract No.	Award Date	Awardee	AWARD AMOUNT	Description
60454	2/06/86	JARL Extrusions	$ 41,520	Conductor
60272	1/10/86	Cressona	28,538	Conductor
61644	1/14/86	Schmitt Forge	57,168	Conductor
19861	10/11/85	Brown Boveri Corp.	52,574,400	HVDC Expansion
60467	1/23/86	Lapp Insulator	88,000	Insulator
60293	1/09/86	NGK Locke	534,760	Insulator
60683	2/15/86	Union Metal	26,250	Tower Steel
62039	2/11/86	AG Industries, Inc.	74,745	Tower Steel
61685	3/20/86	AG Industries	125,910	Tower Steel
60198	10/11/85	Balteau Standard	62,000	Transformers
61216	1/03/86	Westinghouse	2,841,300	Transformers
		TOTAL	$ 56,454,591	

Planned Procurements

	ESTIMATE
* Shunt Capacitors	$ 1,815,000
* Power Circuit Breakers	1,100,000
* Reactors	970,000
* Transformers	1,600,000
* Conductor	125,000
* Tower Steel	26,000
* Relays	2,300,000
TOTAL	$ 7,936,000

Definition contained in the statement on the floor of the Senate during consideration of the Conference Report on H.R. 2050:

Contract No.	Award Date	Awardee	AWARD AMOUNT	Description
19861	10/11/85	Brown Boveri Corp.	$ 52,574,400	HVDC Expansion
60198	10/11/85	Balteau Standard	62,000	Transformers
61216	1/03/86	Westinghouse	2,841,300	Transformers
		TOTAL	$ 55,477,700	

Planned Procurements

	ESTIMATE
* Power Circuit Breakers	$ 1,100,000
* Reactors	460,000
* Transformers	1,600,000
TOTAL	$ 3,160,000

Question: If the same restriction were continued in fiscal 1987, please list each anticipated procurement by your agency that would be affected, estimate the amount of each procurement, and explain the impact of the restriction on the procurement. Provide the same type of information for the period 1988-1992, assuming the restriction were continued for you agency. Again, answer the questions separately for each definition of EHV equipment.

Answer: The following is a list of BPA's planned EHV procurements for the period FY 1987 through FY 1989 subject to the restriction. As yet, no long range procurement plans have been developed for the period from FY 1990 through 1992. The list includes items not specifically identified in the Conference Report. The equipment and materials listed are estimates only and are subject to change.

FISCAL YEAR 1987 PLANNED PROCUREMENTS

Conference Report on H.R. 2959 Definition:

*	Capacitors	3	$ 6,232,750
*	Transformer	1	200,000
*	Power Circuit Breakers	9	3,206,000
*	Disconnects	20	640,000
*	Insulator		930,000
*	Conductor		2,110,000
*	Tower Steel		358,000
*	Reactor	1	2,000,000
*	Relays		900,000
	TOTAL		$16,576,750

Definition contained in the statement on the floor of the Senate during consideration of the Conference Report on H.R. 2050:

*	Transformer	1	$ 200,000
*	Power Circuit Breakers	9	3,206,000
*	Reactor	1	2,000,000
	TOTAL		$ 5,406,000

FISCAL YEAR 1988 PLANNED PROCUREMENTS

Conference Report on H.R. 2959 Definition:

*	Disconnects	20	$ 640,000
*	Series Capacitors	4	9,600,000
*	Power Circuit Breakers	13	4,550,000
*	Transformers	2	1,500,000
*	Tower Steel		492,000
*	Conductor		181,000
*	Conductor Hardware		80,000
*	Relays		600,000
	TOTAL		$ 17,643,000

Definition contained in the statement on the floor of the Senate during consideration of the Conference Report on H.R. 2050:

*	Power Circuit Breakers	13	$ 4,550,000
*	Transformers	2	1,500,000
	TOTAL		$ 6,050,000

FISCAL YEAR 1989 PLANNED PROCUREMENTS

Conference Report on H.R. 2959 Definition:

*	Gas Insulated Substation	1	$ 2,000,000
*	Shunt Capacitors	2	1,840,000
*	Power Circuit Breakers	3	1,050,000
*	Disconnects	3	90,000
*	Relays		600,000
	TOTAL		$ 5,580,000

Definition contained in the statement on the floor of the Senate during consideration of the Conference Report on H.R. 2050:

*	Gas Insulated Substation	1	$ 2,000,000
*	Power Circuit Breakers	3	1,050,000
	TOTAL		$ 3,050,000

Question: How much EHV procurement has your agency undertaken in the last five years (fiscal 1982-1986)? Please list each procurement that would have been affected by the restriction, identify the successful bidder, and specify the dollar amount of the contract awarded. Again, answer the questions separately for each definition of EHV equipment.

Answer: The following list represents BPA's procurements of EHV power equipment during the last five years as defined by the statement on the floor of the Senate during consideration of the Conference Report on H.R. 2050. (This list includes items not specifically identified in the Conference Report.):

BONNEVILLE POWER ADMINISTRATION
5-Year EHV History

FY 1982

Contract No.	Award Date	Awardee	Vendor Nationality	For/Dom. Mfg. Pt.	Domestic($) End Product	Foreign($) End Product	Commodity Description
32820	1/20/82	General Electric	D	D	10,014,755		Capacitors
28794	10/19/81	Cogenel	F France	F		208,210	Circuit Breakers
30456	10/19/81	Cogenel	F France	F		102,900	Circuit Breakers
28148	12/01/81	ASEA	F Sweden	F		30,000,000	HVDC Upgrade
31349	12/31/81	Trench	F Canada	F		571,675	Transformers
32197	2/25/82	Siemens-Allis	D	D	1,922,284		Transformers
31924	3/8/82	Nissho Iwai	F Japan	F		785,000	Transformers
32823	11/20/81	General Electric	D	D	1,839,566		Transformers
31623	11/27/81	Balteau Elec.	F Belgium	F		210,304	Transformers
31517	2/10/82	RTE ASEA	D	F		2,142,331	Transformers
34201	1/10/82	Federal Pacific	D	D	283,000		Transformers
34202	2/10/82	Westinghouse	D	D	151,886		Transformers
32522	2/18/82	American Elin	F Austria	F		223,800	Transformers
36421	5/21/82	Associated Engr.	D	D	37,404		Transformers
34727	5/21/82	Emile Haefely	F Germany	F		121,895	Transformers
34044	6/29/82	Westinghouse	D	D	77,394		Transformers
		TOTAL			14,326,289	34,366,115	

FY 1983

Contract No.	Award Date	Awardee	Vendor Nationality	For/Dom. Mfg. Pt.	Domestic($) End Product	Foreign($) End Product	Commodity Description
39630	11/18/82	Tennessee Valley Authority	D	F France		2,060,000	Circuit Breakers
39633	6/1/84	ASEA, Inc.	F Sweden	F		181,798	Reactors
11785	7/7/83	Westinghouse	D	D	654,075		Transformers
36424	11/18/82	Westinghouse	D	D	1,348,199		Transformers
12881	7/8/83	Square D	D	D	56,740		Transformers
3981	2/3/83	Cogenel	F France	F		317,625	Transformers
39204	1/14/83	Hevi Duty Electric	D	D	322,393		Transformers
39649	3/11/83	General Electric	D	D	335,212		Transformers
39810	4/4/83	McGraw-Edison	D	D	651,100		Transformers
39818	5/19/83	H.K. Porter	D	D	455,208		Transformers
11900	4/5/83	General Electric	D	D	3,052,386		Transformers
		TOTAL			6,855,313	2,559,423	

FY 1984

Contract No.	Award Date	Awardee	Vendor Nationality	For/Dom. Mfg. Pt.	Domestic($) End Product	Foreign($) End Product	Commodity Description
13675	12/23/83	General Electric	D	D	115,386		Capacitors
11298	1/17/84	Westinghouse	D	D	15,220,305		Capacitors
12757	12/23/83	High Voltage Breakers	F Japan	F		6,624,957	Gas Insulated Substation
11957	10/25/83	ASEA, Inc.	F Sweden	F		3,079,030	Reactors
14720	6/8/84	Siemens-Allis	D	D	481,230		Reactors
33106	3/31/82	Westinghouse	D	D	152,779		Reactors
15250	7/2/84	General Electric	D	D	208,029		Transformers
16187	7/2/84	General Electric	D	D	1,976,264		Transformers
17483	8/16/84	Balteau Standard	D	D	39,822		Transformers
18926	8/16/84	Emile-Haefely	F Germany	F		113,280	Transformers
		TOTAL			18,201,595	9,817,267	

FY 1985

Contract No.	Award Date	Awardee	Vendor Nationality	For/Dom. Mfg. Pt.	Domestic($) End Product	Foreign($) End Product	Commodity Description
21180	1/15/85	Westinghouse	D	D	314,100		Capacitors
22766	8/9/85	Westinghouse	D	D	2,306,694		Capacitors
22130	5/15/85	Westinghouse	D	D	730,500		Capacitors
23187	8/27/85	Brown Boveri	F Switzerland	D	275,000		Circuit Breakers
22 11	8/1/85	Brown Boveri Corp.	F Switzerland	F		1,667,607	Gas Insulated Substation
24040	5/17/85	Square D	D	D	37,500		Transformers
19589	12/13/84	ASEA, Inc.	F Sweden	F		404,745	Transformers
23272	7/26/85	Trench	F Canada	F		287,235	Transformers
		TOTAL			3,663,794	2,359,587	

FY 1986

Contract No.	Award Date	Awardee	Vendor Nationality	For/Dom. Mfg. Pt.	Domestic($) End Product	Foreign($) End Product	Commodity Description
19861	10/11/85	Brown Boveri Corp.	F Switzerland	D	52,574,400		HVDC Expansion
60198	10/11/85	Balteau Standard	D	D	62,000		Transformers
61216	1/3/86	Westinghouse	D	D	2,841,300		Transformers
		TOTAL			55,477,700		

The following list represents BPA's procurements of EHV power equipment during the last five years as defined by the Conference Report on H.R. 2959. (This list includes items not specifically identified in the Conference Report.):

BONNEVILLE POWER ADMINISTRATION
5 -Year EHV History

FY 1982

Contract No.	Award Date	Awardee	Vendor Nationality	For/Dom. Mfg. Pt.	Domestic($) End Product	Foreign($) End Product	Commodity Description
32820	1/20/82	General Electric	D	D	10,014,755		Capacitors
28794	10/19/81	Cogenel	F France	F		208,210	Circuit Breakers
30466	10/19/81	Cogenel	F France	F		102,900	Circuit Breakers
30355	10/27/81	Alcoa	D	D	827,377		Conductor Hardware
32644	11/5/81	Columbia	D	D	40,000		Conductor Hardware
31225	11/19/81	Fargo Mfg.	D	D	28,492		Conductor Hardware
31224	11/30/81	Columbia Forge	D	D	35,786		Conductor Hardware
33118	1/29/82	Rome Cable	D	D	197,300		Conductor Hardware
33609	2/11/82	Reynolds Metal	D	D	255,495		Conductor Hardware
34456	4/22/82	Cressona Aluminum	D	D	174,074		Conductor Hardware
34994	5/12/82	Lindsey Mfg. Co.	D	D	34,776		Conductor Hardware
35754	5/13/82	Reynolds Aluminum	D	D	86,286		Conductor Hardware
35407	5/13/82	Reynolds Aluminum	D	D	27,135		Conductor Hardware
35938	7/14/82	Columbia Forge	D	D	39,150		Conductor Hardware
36757	9/23/82	Cressona	D	D	192,700		Conductor Hardware
29115	11/13/81	S&C Electric	D	D	39,368		Fuse Units
33342	1/13/82	S&C Electric	D	D	39,105		Fuse Units
33495	2/25/82	S&C Electric	D	D	57,327		Fuse Units
36155	5/10/82	S&C Electric	D	D	29,556		Fuse Units
36602	7/28/82	S&C Electric	D	D	29,836		Fuse Units
28148	12/01/81	ASEA	F Sweden	F		30,000,000	HVDC Upgrade
31488	12/4/81	Lapp Ins.	D	D	657,000		Insulator
31840	12/10/81	NGK-Locke	D	D	371,903		Insulator
32406	12/10/81	Sediver, Inc.	D	D	214,000		Insulator
32408	12/15/81	NGK-Locke	D	D	75,962		Insulator
33668	12/18/81	Ohio Brass	D	D	720,620		Insulator
36557	5/28/82	Lapp Insulators	D	D	237,330		Insulator
36440	7/20/82	Willamette Mfg.	D	D	169,929		Insulator
37080	9/16/82	Willamette Mfg.	D	D	195,856		Insulator
28444	10/29/81	ASEA	D	D	3,414,293		Relays
34490	4/5/82	General Electric	D	D	68,858		Relays
34942	5/19/82	General Electric	D	D	250,000		Relays
33310	2/3/82	Electra Switch	D	D	44,071		Relays
32510	10/16/81	Schmitt Steel	D	D	70,213		Tower Steel
29901	10/16/81	Trench Co.	F Canada	F		46,502	Tower Steel

FY 1982 (continued)

Contract No.	Award Date	Awardee	Vendor Nationality	For/Dom. Mfg. Pt.	Domestic($) End Product	Foreign($) End Product	Commodity Description
30888	11/9/81	Keiser	D	D	36,598		Tower Steel
31625	11/12/81	Great Western	D	D	27,950		Tower Steel
33313	1/15/82	Greenberry Tank	D	D	164,199		Tower Steel
33683	1/8/82	CF&I Steel	D	D	109,481		Tower Steel
33679	1/21/82	Great Western Steel	D	D	240,526		Tower Steel
33378	2/16/82	ITT Meyers	D	D	65,360		Tower Steel
34947	4/6/82	AZCO Steel	D	D	31,746		Tower Steel
34516	4/13/82	Blodgett Steel	D	D	43,808		Tower Steel
34476	5/6/82	Greenberry Tank	D	D	131,428		Tower Steel
33937	5/4/82	Bethlehem Steel	D	D	57,993		Tower Steel
34974	5/19/82	Willamette Mfg.	D	D	302,198		Tower Steel
35391	5/28/82	Valmonte/ALS	D	D	66,900		Tower Steel
33621	6/10/82	Societa Gnonima	F Italy	F		59,040	Tower Steel
36995	7/21/82	Modulus Corp.	D	D	27,722		Tower Steel
35978	7/8/82	LaGrand Steel	D	D	112,556		Tower Steel
37476	7/14/82	Great Western	D	D	85,669		Tower Steel
37765	7/30/82	Koff Electric	D	D	54,583		Tower Steel
37201	9/1/82	American Steel	D	D	38,426		Tower Steel
36759	9/3/82	Bethlehem Steel	D	D	310,389		Tower Steel
37177	9/16/82	Lehigh Structural	D	D	39,957		Tower Steel
31349	12/31/81	Trench	F Canada	F		571,675	Transformers
32197	2/25/82	Siemens-Allis	D	D	1,922,284		Transformers
31924	3/8/82	Nissho Iwai	F Japan	F		785,000	Transformers
32823	11/20/81	General Electric	D	D	1,839,566		Transformers
31623	11/27/81	Balteau Elec.	F Belgium	F		210,304	Transformers
31517	2/10/82	BTE ASEA	D	F		2,142,331	Transformers
34201	1/10/82	Federal Pacific	D	D	283,000		Transformers
34202	2/10/82	Westinghouse	D	D	151,886		Transformers
32522	2/18/82	American Elin	F Austria	F		223,800	Transformers
36421	5/21/82	Associated Engr.	D	D	37,404		Transformers
34727	5/21/82	Emile Haefely	F Germany	F		121,895	Transformers
34044	6/29/82	Westinghouse	D	D	77,394		Transformers
		TOTAL			24,897,576	34,471,657	

FY 1983

Contract No.	Award Date	Awardee	Vendor Nationality	For/Dom. Mfg. Pt.	Domestic($) End Product	Foreign($) End Product	Commodity Description
39630	11/18/82	Tennessee Valley Authority	D	F France		2,060,000	Circuit Breakers
39955	1/26/83	Reynolds Metals	D	D	367,556		Conductor
12111	8/4/83	Anderson Forge	D	D	43,840		Conductor Hardware
39942	1/26/83	Sowa & Sons	D	D	43,365		Conductor Hardware
11185	4/1/83	S & C Electric	D	D	72,134		Fuse Units
11374	7/29/83	NGK Locke	D	D	651,068		Insulators
39952	12/21/82	NGK Locke	D	D	178,560		Insulators
39795	12/21/82	Lapp Insulators	D	D	68,400		Insulators
39633	6/1/84	ASEA, Inc.	F Sweden	F		181,798	Reactors
11669	8/5/83	Wes End Welding Fab.	D	D	62,090		Tower Steel
39749	1/28/83	Seattle Western Industries	D	D	29,872		Tower Steel
37909	10/28/82	Oregon Machine Erectors	D	D	32,000		Tower Steel
11381	9/30/83	Bethlehem Steel	D	D	117,269		Tower Steel
11121	9/29/83	Anchor Metals	D & F	D & F	9,329,207	3,925,430	Tower Steel
39735	11/30/82	Anchor Metals	D	D	246,988		Tower Steel
12805	9/29/83	Great Western Steel	D	D	500,584		Tower Steel
11120	5/27/83	Nissho-Iwai	F Japan	F		737,759	Tower Steel
11381	9/30/83	Bethlehem Steel	D	D	176,930		Tower Steel
39545	11/4/82	Far West Steel	D	D	31,648		Tower Steel
39632	10/14/82	Great Western Steel	D	D	84,350		Tower Steel
39272	10/20/82	LaGrand Steel	D	D	25,785		Tower Steel
11373	6/23/83	Willamette Mfg.	D	F		87,595	Tower Steel
13046	9/29/83	Willamette Mfg.	D	D	795,752		Tower Steel
11785	7/7/83	Westinghouse	D	D	654,075		Transformers
36424	11/18/82	Westinghouse	D	D	1,348,199		Transformers
12881	7/8/83	Square D	D	D	36,740		Transformers
39981	2/3/83	Cogenel	F France	F		317,625	Transformers
39204	1/14/83	Hevi Duty Electric	D	D	322,393		Transformers
39649	3/11/83	General Electric	D	D	335,212		Transformers
39810	4/4/83	McGraw-Edison	D	D	651,100		Transformers
39818	5/19/83	H.K. Porter	D	D	455,208		Transformers
11900	4/5/83	General Electric	D	D	3,052,386		Transformers
		TOTAL			19,712,691	7,310,207	

FY 1984

Contract No.	Award Date	Awardee	Vendor Nationality	For/Dom. Mfg. Pt.	Domestic($) End Product	Foreign($) End Product	Commodity Description
13675	12/23/83	General Electric	D	D	115,186		Capacitors
11298	1/17/84	Westinghouse	D	D	15,228,305		Capacitors
12723	10/13/83	ALCOA	D	D	95,007		Conductor
14063	2/16/84	Kaiser Alum. & Chem.	D	D	117,392		Conductor
12714	11/25/83	ALCOA	D	D	20,269,547		Conductor
12741	11/25/83	ALCOA	D	D	5,221,006		Conductor
12716	10/17/83	Davis Walker	D	D	398,652		Conductor
14848	11/10/83	Reynolds Metals	D	D	9,846,578		Conductor
16598	6/11/84	Rome Cable Corp.	D	D	107,000		Conductor
13852	12/20/83	Fargo Mfg.	D	D	107,581		Conductor
13045	10/31/83	ALCOA	D	D	32,883		Conductor Hardware
12728	10/14/83	Anderson Forge	D	D	254,320		Conductor Hardware
14549	10/14/83	Lindsey Mfg.	D	D	40,132		Conductor Hardware
14550	10/14/83	Schmitt Forge	D	D	165,698		Conductor Hardware
12757	12/23/83	High Voltage Breakers	F Japan	F		6,624,957	Gas Insulated Substation
12715	11/23/83	NGK Locke	D	D	3,767,408		Insulator
14990	11/25/83	Italisolatori	F Italy	F		1,109,014	Insulator
13043	11/22/83	Sediver	D	D	311,321		Insulator
14438	2/24/84	Lapp Insulator	D	D	206,205		Insulator
16784	9/20/84	NGK Locke	D	D	108,327		Insulator
24518	8/22/84	Reliable Electric	D	D	92,000		Insulator
13043	12/6/83	Sediver	D	D	451,059		Insulator
11957	10/25/83	ASEA, Inc.	F Sweden	F		3,079,030	Reactors
14720	6/8/84	Siemens-Allis	D	D	481,210		Reactors
33106	3/31/82	Westinghouse	D	D	152,779		Reactors
15297	12/20/83	General Electric	D	D	372,774		Relays
14067	1/18/84	Anchor Metals	D	D	152,683		Tower Steel
15313	5/23/84	Willamette Mfg.	D	D	39,205		Tower Steel
14461	1/24/84	CE American Pole	D	D	771,332		Tower Steel
14871	12/7/83	Sumitomo Corp.	F Japan	F		31,541	Tower Steel
14353	2/1/84	Union Metal	D	D	130,094		Tower Steel
15579	2/10/84	Valmont	D	D	127,229		Tower Steel
16010	2/10/84	ITT Meyers Ind.	D	D	25,286		Tower Steel
14461	1/19/84	Anchor Metals	D	D	104,529		Tower Steel
14052	1/16/84	Willamette Mfg.	D	D	44,889		Tower Steel
15250	7/2/84	General Electric	D	D	208,029		Transformers
16187	7/2/84	General Electric	D	D	1,976,264		Transformers
17483	8/16/84	Balteau Standard	D	D	39,822		Transformers
18926	8/16/84	Emile-Haefely	F Germany	F		113,280	Transformers
		TOTAL			61,561,732	10,957,822	

FY 1985

Contract No.	Award Date	Awardee	Vendor Nationality	For/Dom. Mfg. Pt.	Domestic($) End Product	Foreign($) End Product	Commodity Description
21180	1/15/85	Westinghouse	D	D	314,100		Capacitors
22766	8/9/85	Westinghouse	D	D	2,306,694		Capacitors
22130	5/15/85	Westinghouse	D	D	730,500		Capacitors
23187	8/27/85	Brown Boveri	F Switzerland	D	275,000		Circuit Breakers
21896	5/20/85	TRW Palnut	D	D	42,725		Condcutor Hardware
20823	3/18/85	JARL Extrusions	D	D	43,110		Conductor
19310	10/26/84	ALCOA	D	D	70,830		Conductor
21983	6/13/85	Kaiser Aluminum	D	D	3,072,254		Conductor
22123	5/10/85	ALCOA	D	D	406,193		Conductor
21995	4/18/85	Davis Walker	D	D	73,980		Conductor
23385	9/12/85	Reynolds Metals	D	D	50,598		Conductor
21991	4/10/85	ALCOA	D	D	33,795		Conductor
23873	8/21/85	ALCOA	D	D	40,712		Conductor
22425	6/21/85	West Wire	D	D	96,750		Conductor
23969	5/15/85	Lindsey Mfg.	D	D	55,707		Conductor Hardware
23967	5/15/85	Schmitt Forge	D	D	48,911		Conductor Hardware
22111	8/1/85	Brown Boveri Corp.	F Switzerland	F		1,667,607	Gas Insulated Substation
16784	9/20/84	NGK Locke	D	D	123,177		Insulator
21989	5/19/85	NGK Locke	D	D	163,200		Insulator
23351	12/15/85	Lapp Insulator	D	D	58,266		Insulator
19027	10/16/84	Lapp Insulator	D	D	106,980		Insulator
24374	9/19/85	Sediver	D	D	39,560		Insulator
23847	9/20/85	Sediver	D	D	61,140		Insulator
24518	8/16/85	Reliable Electric	D	D	92,000		Insulator
20037	12/7/84	Potter & Brumfield	D	D	130,199		Relays
21895	8/12/85	Modulus Corp.	D	D	93,986		Tower Steel
18790	1/16/85	Anchor metals	D	D	3,691,014		Tower Steel
20759	4/14/85	ITT Meyers Ind.	D	D	81,450		Tower Steel
20394	1/7/85	ITT Meyers Ind.	D	D	33,162		Tower Steel
20759	5/1/85	ITT Meyers Ind.	D	D	81,450		Tower Steel
21068	2/22/85	Willamette Mfg.	D	D	320,875		Tower Steel
23455	9/26/85	Willamette Mfg.	D	D	41,881		Tower Steel
24040	5/17/85	Square D	D	D	37,500		Transformers
19589	12/13/84	ASEA, Inc.	F Sweden	F		404,745	Transformers
23272	7/26/85	Trench	F Canada	F		287,235	Transformers
		TOTAL			12,817,699	2,359,587	

FY 1986

Contract No.	Award Date	Awardee	Vendor Nationality	For/Dom. Mfg. Pt.	Domestic($) End Product	Foreign($) End Product	Commodity Description
60454	2/6/86	JARL Extrusions	D	D	41,520		Conductor
60272	1/10/86	Cressona	D	D	28,538		Conductor
61644	1/14/86	Schmitt Forge	D	D	57,168		Conductor
19861	10/11/85	Brown Boveri Corp.	F Switzerland	D	52,574,400		HVDC Expansion
60467	1/23/86	Lapp Insulator	D	D	88,000		Insulator
60293	1/9/86	NGK Locke	D	D	534,760		Insulator
60683	2/15/86	Union Metal	D	D	26,250		Tower Steel
62039	2/11/86	AG Industries, Inc.	D	D	74,745		Tower Steel
61685	3/20/86	AG Industries	D	D	125,910		Tower Steel
60198	10/11/85	Balteau Standard	D	D	62,000		Transformers
61216	1/3/86	Westinghouse	D	D	2,841,300		Transformers
		TOTAL			56,454,591		

Question: Please identify the American manufacturers of EHV equipment. In your opinion, are there sufficient American EHV manufacturers to offer competitive bidding in EHV equipment procurement? Answer the questions separately for each definition of EHV equipment.

Answer: The following list identifies domestic manufacturers of EHV equipment as defined by the statement of the floor of the Senate during consideration of the Conference Report on H.R. 2050:

1. Power Transformers - GE, Westinghouse, Mc-Graw.*
2. Convertor Transformers - GE.**
3. Shunt Reactors - GE.**
4. Breakers - None.**
5. HVDC Equipment - GE.**
6. GIS Equipment - None.**

The following list identifies domestic manufacturers of the additional items included in the definition of EHV equipment contained in the Conference Report on H.R. 2959:

1. Switchgear - S&C, S/A, Southern States.*
2. Instrument Transformers - Westinghouse.**
3. Surge Arrestors - GE, O-B, McGraw, Westinghouse.*
4. Shunt Capacitors - GE, Westinghouse.*
5. Series Capacitors - GE, Westinghouse.*
6. Tower Steel, Conductor, and Insulators - Several domestic manufacturers offer these items and adequate competition exists.

Adequate Competition: * - Yes, ** - No

Question: Do you think that this type of "Buy American" provision could have a harmful impact on our relations with those trading partners with whom we enjoy a very favorable balance of trade? Do you believe that an appropriations measure is the appropriate vehicle to deal with a complex trade issue that could have significant trade policy consequences?

Answer: The threat of foreign retaliation is one of the primary reasons for the Administration's opposition to "Buy American" provisions. The Administration believes the inclusion of such language in appropriation acts is inappropriate because the trade committees are deprived of an opportunity to weigh such language in the context of overall U.S. trade policy.

New Resource

The Regional Power Act specified that the "preference" rates were limited to the "general needs" of public utilities and specifically excluded "new large single loads" from that definition. In other words, if a public utility were to obtain a large new industrial customer, rather than serve that customer out of the so-called 7(b) pool of power, which is the lowest cost available, the new industrial customer would pay the "new resource," or 7(f) rate.

I am concerned about reports that efforts are being made which violate the spirit, if not the letter, of this provision. New large single loads are defined as those which add at least 10 megawatts in a 12-month period. By a gradual shift of, say, 9.9 megawatts per year for 5 years, a very large load can be placed on a public utility at the 7(b) rate providing an incentive which is clearly at odds with the intent of the Regional Act.

As Administrator, you have made great efforts to bring about the regional cooperation which was a major goal of the Regional Act. Such cooperation is obviously hindered if one group of utilities is able to subvert the provisions of the Act to entice customers of another group to switch utilities. Bonneville must exercise some oversight responsibility in this area. It may be that some clarification of the Act is required as well.

Question: Could you explain how BPA handles the new large single load question when the customer being acquired is clearly larger than the 10 megawatt threshold, but is brought over on a gradual basis to escape the Act's definition?

Answer: The New Large Single Load provisions of the Pacific Northwest Power Act were implemented in 1981 through BPA's utility power sales contracts. These contracts require a load to be considered a New Large Single Load if its energy consumption increases by 10 average megawatts or more in any consecutive 12-month period, as compared against the preceding 12-month period. New Large Single Loads are billed at the New Resource Firm Power Rate.

Loads which do not reach the 10 average MW annual threshold are, conversely, not considered New Large Single Loads. They may be served with priority firm power if they can be brought on line "phased-in" in annual increments of up to 9.9 average MW per year, regardless of their ultimate size.

For example, a new plant which anticipates eventually operating at 25 MW could receive 9.9 average MW of power the first year at the Priority Firm Power Rate. The second year, another 9.9 average MW could be phased-in (19.8 average MW total); the third year, the remaining 5.2 average MW (25 average MW total). In this manner, the plant never becomes a New Large Single Load as long as the annual increase in its power requirements stays under the 10 average MW limit.

During the power sales contract negotiations in 1981, the "phase-in" concept represented BPA's understanding of the New Large Single Load provision of the Pacific Northwest Power Act (section 3(13)(B)). The concept was negotiated and incorporated into the contracts. BPA has consistently applied it in good faith without discrimination since 1981.

SOUTHEASTERN POWER ADMINISTRATION

STATEMENT OF HARRY C. GEISINGER, ADMINISTRATOR

Chairman HATFIELD. Mr. Geisinger, I believe that Southeastern is probably the next in line based on age of the PMA's. We invite you to make your statement and will put your full statement in the record. You may proceed.

POWER MARKETING POLICIES

Mr. GEISINGER. Thank you, Mr. Chairman.

Mr. Chairman and members of the committee, it is a pleasure to once again appear before this committee to discuss Southeastern's budget request for fiscal year 1987.

Since I last appeared before this committee, Southeastern has made significant progress in implementing the new power marketing policies. Contract negotiations just completed with the South Carolina Public Service Authority, Duke Power Co., South Carolina Electric and Gas Co., and preference agencies in their service areas added 26 new preference customers, thus completing the implementation of the Georgia-Alabama power marketing policy.

The final power marketing policy for the two-project Kerr-Philpott System has been completed and issued. Negotiations are currently in progress with Appalachian Power Co., Virginia Power, Carolina Power & Light Co., and preference entities within their service areas to carry out the policy. These negotiations are expected to add 48 new preference customers to those we are now serving.

SEPA presently markets power from 22 multipurpose projects to 248 power purchasers, serving approximately 400 preference customers. Estimated power revenues for fiscal year 1987 are $130 million, reflecting the sale of 3,092 megawatts of installed capacity with 7.4 billion kilowatt-hours of energy.

REPAYMENT STATUS AND BUDGET REQUEST

SEPA's repayment status is very good. From inception in 1950 to September 30, 1985, operating revenues available for repayment totaled $1.2 billion. These revenues were allocated to the repayment of $482 million to operating expenses, $444 million to interest expense, and $310 million to capital investment in electric projects. By the end of fiscal year 1985, SEPA's total capital investment was $1.3 billion, less the amount repaid, leaving a balance of $992 million to be repaid.

A funding level of $21.7 million is requested in the President's 1987 budget to allow SEPA to carry out its mission. Of this request, $2 million is for the system operations and maintenance activity. The major portion of the budget request, $19.7 million, is requested for the purchase power and wheeling activity. No increase in the manpower level of 40 full-time equivalents is requested in fiscal year 1987, although significant increases will occur in the workload.

Mr. Chairman, this concludes my brief statement, and I would be happy to answer any questions from you or the members of the committee.

[The statement follows:]

STATEMENT OF HARRY C. GEISINGER, ADMINISTRATOR, SOUTHEASTERN POWER ADMINISTRATION

Mr. Chairman and Members of the Committee:

It is a pleasure to appear before you today to discuss Southeastern Power Administration's (SEPA) budget request for fiscal year 1987.

Southeastern Power Administration, with headquarters in Elberton, Georgia, markets hydroelectric power from projects constructed and operated by the U. S. Army Corps of Engineers located in 10 southeastern states. Southeastern has no transmission lines and accomplishes the delivery of power by wheeling agreements with power utilities in the area that have the necessary transmission facilities.

Southeastern presently markets power from 22 multiple-purpose projects to 248 power purchasers. Estimated power revenues for FY 1987 are $130,417,000, reflecting the sale of 3,092 megawatts of installed capacity with 7.4 billion kilowatt-hours of energy.

Southeastern's overall repayment status is as follows: from inception in 1950 to September 30, 1985, operating revenues available for repayment totaled $1,233,859,000. These revenues were allocated to payment of $482,583,000 of annual operating expenses, $444,266,000 of interest expense, and $310,010,000 of capital investment in electric plant. The total capital plant on September 30, 1985, of $1,302,717,000, less the amount repaid, leaves a balance of $992,707,000 to be repaid.

FY 1987 BUDGET

A funding level of $21,736,000 is requested in the President's 1987 Budget to effectively carry out Southeastern's mission. The FY 1987 program level request represents an increase of $7,001,000 over the amount authorized for the current year.

A comparison by activities of the FY 1987 Operations and Maintenance budget request with the amounts available in FY 1986 is as follows:

	FY 1986	FY 1987	Difference
System Operation and Maintenance	$ 1,856,000	$ 2,031,000	+$ 175,0
Purchase Power and Wheeling Charges	12,879,000	19,705,000	+6,826,00
Total Program Level	14,735,000	21,736,000	+7,001,000
Deferral Applied	-14,735,000	-2,089,000	
New Budget Authority Requested		19,647,000	

SYSTEM OPERATION AND MAINTENANCE

The request of $2,031,000 for the System Operation and Maintenance activity will provide funds for the negotiation and administration of wheeling and power sales contracts; development and review of rates to assure repayment of power costs; scheduling the generation of power and supervision of power deliveries; and direction and support of Southeastern's power marketing program. This amount represents a $175,000 increase over the amount available in the current year.

The major portion of the request for this activity provides funding for personnel compensation and related costs and reflects the continuation of the current manpower level of 40 full-time equivalents. The request provides for increases resulting primarily from statutory within-grade and Performance Management Recognition System increases, terminal leave payments, additional personnel benefit costs, and higher administrative costs for support functions.

No increase in the manpower level of 40 full-time equivalents is requested for FY 1987, although significant workload increases will occur. As a result of changes in the marketing program, Southeastern will serve significantly more customers within enlarged marketing areas under different marketing conditions, affecting workload throughout the agency. Southeastern will strive to accomplish these workload increases within the current manpower level through improved management of employee resources and additional use of automation

PURCHASE POWER AND WHEELING

The major portion of the budget request, $19,705,000, is required for the Purchase Power and Wheeling activity and represents an increase of $6,826,000 over the amount available in the current year.

Funds provided for this activity are used to pay amounts charged the Government under contractual arrangements for (1) delivery of power over non-Federal systems to load centers of preference customers for the account of the Government, (2) purchase by the Government of energy, if necessary, during adverse water periods, and (3) support capacity required to meet commitments for the Jim Woodruff Project under adverse water conditions.

In the absence of ownership or operation of transmission facilities, Southeastern carries out its marketing program by utilizing the existing transmission systems of the power utilities within its marketing area. This is accomplished through "wheeling" arrangements between Southeastern and each of the area utilities who have transmission lines connected to the projects, under which the utility agrees to deliver specified amounts of Federal power to customers of the Government and Southeastern agrees to compensate the utility for the transmission service performed.

Southeastern has been deeply involved in the development and implementation of new power marketing policies for its respective systems which will ultimately allow all available Southeastern power, both capacity and energy, to be marketed to preference customers in the future. These new policies have been implemented as new contracts were executed for the respective marketing areas.

Contracts providing for the sale of all power to both existing and new preference customers which are expected to be in effect during FY 1987 cover the following Southeastern sales:

1. That portion of the power produced in the Georgia-Alabama System to be marketed within the service areas of South Carolina Public Service Authority, South Carolina Electric & Gas Company, and Duke Power Company.

2. That portion of the power produced in the Cumberland System which is wheeled outside the TVA service area as well as that portion to be sold within the TVA service area.

3. All power produced in the Kerr-Philpott System to be marketed in the Appalachian Power Company, Virginia Power, and Carolina Power & Light Company service areas.

4. That portion of the power produced in the Cumberland System and designated to be marketed in the service areas of Carolina Power & Light Company (Western Division), and Kentucky Utilities.

With respect to that portion of the power produced in the Georgia-Alabama System and sold in the Southern Company service area (Georgia, Alabama, Mississippi, and the panhandle of Florida), wheeling charges will be handled, to the extent possible, by "net billing" with the affected utilities during this period. Decreasing quantities of capacity will be sold to the utilities through May 1991, and charges to the utilities for this capacity will be used to offset charges by the utilities for transmission services provided. During FY 1987, increased funding will be required for payment of transmission services under contractual arrangements with Georgia Power Company, since capacity sales to the company will be insufficient to fully "net bill" the charges for transmission services provided by the Company.

Additionally, purchase power and wheeling funds are required under the provisions of existing contracts for the sale of power produced at the Jim Woodruff project and now sold in the Florida Power Corporation service area.

Southeastern's projects are grouped for marketing purposes into four financially independent systems. The power systems, customer locations, and status of wholesale rate adjustments are hereinafter discussed. Southeastern has accomplished all of its recent rate adjustments with a minimum of difficulty.

GEORGIA-ALABAMA SYSTEM

The Georgia-Alabama System is comprised of the Allatoona, Buford, Carters, Clarks Hill, Walter F. George, Hartwell, Robert F. Henry (formerly Jones Bluff), Millers Ferry, Richard B. Russell, and West Point projects. Two of the four units at Carters are pump-generator units. Power from the system is sold to customers located in Georgia, Alabama, North and South Carolina, Mississippi, and Florida.

Power rates for this system, applicable from October 1, 1985, through September 30, 1990, were approved on an interim basis by the Deputy Secretary of Energy on September 30, 1985, and forwarded to the Federal Energy Regulatory Commission for final approval.

The Richard B. Russell Project began initial generation in January 1985, with three conventional units (225,000 kw) beginning initial generation during FY 1985, and the remaining conventional power unit, (75,000 kw) scheduled to be online during FY 1986. The four pump-generator units, which will provide an additional nameplate capacity of 300,000 kw, are scheduled to begin operation during 1990.

The addition of this project's nameplate capacity of 600,000 kw represents the most significant increase in the marketing product of Southeastern Power Administration since 1975.

CUMBERLAND BASIN SYSTEM

The Cumberland Basin System includes the Wolf Creek, Center Hill, Dale Hollow, Old Hickory, Cheatham, Barkley, J. Percy Priest, Cordell Hull and Laurel projects. The projects are located on the Cumberland

River, or its tributaries, and are located in northern Tennessee and southern Kentucky.

System power is marketed to customers located in Tennessee and in portions of Mississippi, Kentucky, and Illinois. Power rates, applicable from July 1, 1984, through June 30, 1989, were approved by the Federal Energy Regulatory Commission on a final basis on December 27, 1984.

KERR-PHILPOTT SYSTEM

Power from the John H. Kerr and Philpott projects, located in the Roanoke River Basin in Virginia, is marketed to customers in Virginia and North Carolina. The Federal Energy Regulatory Commission approved power rates for this system on a final basis on July 6, 1983, effective April 1, 1983, for the period ending September 30, 1986.

JIM WOODRUFF SYSTEM

The Jim Woodruff Project is located on the Apalachicola River on the Georgia-Florida state line. All dependable capacity available at the Project is sold to preferred customers in peninsular Florida.

Revised power rates for the Jim Woodruff Project were approved on an interim basis by the Assistant Secretary for Conservation and Renewable Energy and were placed in effect on August 20, 1982. Final approval of the rates was issued by the Federal Energy Regulatory Commission on January 10, 1983, for the period ending August 19, 1987.

POTENTIAL ADDITIONAL RESOURCES

Southeastern has been coordinating with various District offices of the Corps of Engineers in examining the feasibility of installing generating units at several existing projects in the area within which Southeastern has marketing responsibility and at selected projects outside the area.

The potential hydropower project examinations that Southeastern will be performing during fiscal year 1987 include but are not limited to the following:

(1) the replacement of the William Bacon Oliver Lock and Dam in Alabama, (2) the Bluestone and Tygart projects in West Virginia, (3) four existing reservoirs in the Green River Basin in Kentucky, (4) the Celina Project on the Cumberland River, (5) locks and dams on the Ohio River, (6) projects in the Lehigh River Basin in Pennsylvania, and (7) the addition of hydropower to existing projects in Indiana and Ohio.

POWER MARKETING POLICY FORMULATION

Southeastern has been deeply involved in the formulation of new written power marketing policies for its several systems, with broad public participation, to replace previous ad hoc approaches to power marketing. Major issues requiring attention in each instance include marketing area, allocations of power, handling of pumped-storage energy, utilization of area utility systems, wholesale and resale rates, and conservation measures. The major goal of each policy is to market all available power to preference agencies.

Southeastern has published final marketing policies for its ten-project Georgia-Alabama System, its nine-project Cumberland System, and its two-project Kerr-Philpott System. Policy action with respect to the Jim Woodruff System is not anticipated in the near future since all dependable capacity and energy is presently being sold to preference customers.

All Southeastern power marketing policies contain guidelines, including proposed marketing areas and allocation formulas, for marketing the available power for approximately the next ten years.

POWER MARKETING POLICY IMPLEMENTATION

Long-term contractual arrangements implementing the Cumberland System Power Marketing Policy have been negotiated and placed into effect with the Tennessee Valley Authority (TVA), benefiting 160 preference customers within the TVA service area, and with preference customers in portions of Mississippi, Kentucky, and Illinois.

The Cumberland Policy also provides for the sale of Cumberland power to public bodies and cooperatives located in the Kentucky Utilities Company service area and in the Western Division of the Carolina Power & Light Company area. Service to these preference customers will be delayed pending development of wheeling contracts with these utility systems. Southeastern plans to move expeditiously to complete the marketing program in this area as soon as possible.

New long-term arrangements have been placed in operation for the western portion of the Georgia-Alabama System implementing the Georgia-Alabama System Power Marketing Policy. Contracts have been executed with the operating utilities of the Southern Company (Georgia, Alabama, Mississippi, and Gulf Power Companies) and preference customers in their service areas. Under these arrangements, the conversion to the policy of ultimately marketing all power to preference customers will be phased in over a seven-year period.

Negotiations have been completed and contracts executed with South Carolina Public Service Authority, Duke Power Company, South Carolina Electric & Gas Company, and preference agencies within their service areas covering the marketing of power produced in the Georgia-Alabama System and sold in the eastern portion of that System. These negotiations added 26 new preference customers.

Negotiations are currently in progress with Appalachian Power Company, Virginia Power Company, Carolina Power & Light Company, and preference entities within their service areas to implement the Kerr-Philpott Power Marketing Policy. These negotiations are expected to add some 48 new preference customers.

This concludes my statement, Mr. Chairman, and I would be happy to answer any questions that you may have.

BIOGRAPHICAL SKETCH

HARRY C. GEISINGER

Harry C. Geisinger became the fifth Administrator of the Southeastern Power Administration on November 30, 1981, having been appointed to that post by U. S. Secretary of Energy James B. Edwards.

Established in 1950, the Southeastern Power Administration markets federal hydroelectric power produced at Corps of Engineers' constructed projects in the States of Georgia, Florida, Alabama, Mississippi, North Carolina, South Carolina, Kentucky, Tennessee, West Virginia, and Virginia. Based in Elberton, Georgia, Southeastern presently markets power produced at 22 multiple-purpose projects with installed capacity of 3,092 megawatts.

Prior to his appointment, Geisinger owned Geisinger Advertising and Public Relations in Atlanta. He has also served as president of Carbon Fuels, Incorporated, in Atlanta, and as president of Uniway of East Tennessee, Incorporated, in Blountville, Tennessee.

Geisinger served in the Georgia House of Representatives from 1968 through 1974 and was minority whip from 1970-1974.

He received an associate of arts degree at Lincoln College in 1958 and later studied business administration at the University of Cincinnati. He served in the U. S. Navy from 1953-1957.

Born in Cincinnati, Ohio, in 1932, he is married to the former Patricia Virginia Capdau of New Orleans. The couple has three children and reside in Dunwoody, Georgia, where Mr. Geisinger has been active in community and youth activities.

REPAYMENT REFORM

Chairman HATFIELD. Thank you very much.

The Senator from North Dakota, do you have any questions?

Senator BURDICK. No questions.

Chairman HATFIELD. We have a number of questions which we will submit for the record. I would like to just ask one question at this time, Mr. Geisinger. What impact would the proposed repayment reform have on Southeastern power rates?

Mr. GEISINGER. The impact on the wholesale rates would be about a 10-percent increase.

Chairman HATFIELD. How much?

Mr. GEISINGER. Ten percent, on wholesale rates.

Chairman HATFIELD. How would this affect the consumer as far as rate increases?

Mr. GEISINGER. Well, when you consider that we serve 2 percent of the total load in the Southeast and 6 percent of our preference customers' load, it would factor out to almost no increase at all.

ADDITIONAL PREPARED QUESTIONS FOR THE RECORD

Chairman HATFIELD. Thank you very much.

The subcommittee has some additional prepared questions which will be included in the record for your response.

[The questions and answers follow:]

QUESTIONS SUBMITTED BY CHAIRMAN HATFIELD

Southeastern Power Administration (SEPA)

Question: What accounts for the $6.8 million increase in Purchase Power and Wheeling requirements?

Answer: The increase is primarily due to increased costs to be paid to the Georgia Power Company. Wheeling charges to transmit power to preference customers in the Southern Company service area are handled, to the extent possible, by net billing. Since capacity sales to Georgia Power Company will be insufficient to fully net bill the charges for transmission services provided by that Company, more funds are requested to pay the Company. In addition, there are increased costs due to final implementation of the power marketing policy in the eastern portion of Georgia-Alabama System and some general increases in transmission costs in other systems.

Question: What impact will the proposed repayment changes have on Southeastern's rates?

Answer: Southeastern's wholesale rates will increase by approximately $13 million or 10 percent due to the proposed repayment changes.

Question: What portion of your available power is not sold as peaking power?

Answer: Southeastern's power is scheduled by the operating utility in each of its service areas so as to best fit the operating utility's needs. Since all of Southeastern's power is hydro power, and the most efficient use of hydro power is as peaking power with fossil or nuclear generation supplying the base load needs, all of Southeastern's power is used to meet peak hour needs except for several low head projects where lack of storage capacity at time of surplus water conditions, and navigation releases, require operating the projects during off peak hours.

Question: Why does the justification narrative imply that SEPA is not in full compliance with the law?

Answer: While the law specifies that SEPA give preference in the sale of its power to public bodies and cooperatives, SEPA has not been able to market all elements of its power to preference customers in the past. Power not sold to the preference customers was sold to the utilities who perform wheeling services for SEPA. Now, however, due to preference customer load growth and a shift in the power rate structures in the area, preference customers are able to fit all of SEPA's peaking power into their load curves and use the power both physically and economically. For these reasons, SEPA's new written policies for its several systems anticipate that in the future all power will be sold to preference customers with no sales to the investor owned utilities who now provide the transmission services.

Question: Are any of your sales to non-preference utilities? Please explain.

Answer: All of Southeastern's sales are to preference customers except for a temporary sale of capacity without energy to the operating companies of the Southern Company (Georgia Power Company, Alabama Power Company, Mississippi Power Company, and Gulf Power Company) and sales to Florida Power Corporation of small quantities of energy when generation is in excess of load factor for the capacity sold to preference customers in the company service area.

The contracts with the operating companies of the Southern Company provide that the sale of capacity to the companies will be decreased periodically between now and June 1991 when the sale of capacity will be terminated and all of Southeastern's capacity will be marketed to preference customers.

SOUTHWESTERN POWER ADMINISTRATION

STATEMENT OF RONALD H. WILKERSON, ADMINISTRATOR

Chairman HATFIELD. Mr. Wilkerson, we will now hear from Southwestern, and we are happy to welcome you here today as Administrator of the Southwestern Power Administration. I am happy to know that you got your training and experience at Bonneville Power Administration.

Mr. WILKERSON. Thank you, Mr. Chairman, members of the committee. This is my second opportunity to testify before your committee. I am pleased to be here today. I will briefly summarize my prepared statement.

Chairman HATFIELD. Your full statement will be placed in the record.

BUDGET REQUEST FOR 1987

Mr. WILKERSON. Southwestern Power Administration's proposed budget for fiscal year 1987 is $38.6 million, which is about 1.6 percent greater than our proposed budget for fiscal year 1986.

Our need for appropriated funds in fiscal year 1987, however, is substantially less, $25.3 million, due to an unusually large amount of carryover funds from fiscal year 1985, on the order of $13.3 million. The Southwestern Power Administration program for fiscal year 1987 contains no new starts.

For the second year in a row, Southwestern Power Administration has been fortunate enough to set records in 1985 for total revenue received and for repayment of long-term debt. We expected our total revenue last year to be about $98.6 million, but due to exceptional rainfall and prudent resource management, our total revenue actually exceeded $120 million. We applied $39.7 million to repayment of principal on our long-term debt, which was more than double the amount that we had anticipated would be applied in that year.

REPAYMENT STATUS

Cumulative debt repayment for Southwestern Power Administration now stands at $102 million, which is 12 percent of the repayable investment of $839 million.

We are continuing our efforts to reduce the need for appropriated funds to purchase energy. We are doing this in two ways: As our existing power sales contracts expire, we are replacing those with contracts with reduced obligations for Southwestern Power Administration to supply energy. Also, we are making arrangements for certain customers to pay suppliers directly for energy that was previously purchased by Southwestern on a reimbursement basis. In the absence of these two successful efforts, our request for appropriations in fiscal year 1987 would have been $15 million greater.

Southwestern Power Administration has been actively cooperating and facilitating, in fact, the non-Federal funding arrangements for hydroelectric generating projects which are both economically feasible and environmentally acceptable. One such project, Town Bluff, was placed under contract in 1985. Several others are in various stages of discussion, negotiation, or development, including the W.D. Mayo project, which is sponsored by the Cherokee Nation of Oklahoma.

We are also beginning to use a cost-sharing approach to the financing needed for transmission system additions. Costs will be allocated to involved parties proportionally to the benefits that are anticipated, while recognizing the need for Southwestern Power Administration to make main system additions to maintain acceptable levels of reliability.

That completes my statement, Mr. Chairman, and I will be pleased to answer questions.

[The statement follows:]

STATEMENT OF RONALD H. WILKERSON, ADMINISTRATOR, SOUTHWESTERN POWER ADMINISTRATION

Mr. Chairman and Members of the Committee:

It is a pleasure to present the Southwestern Power Administration's (SWPA) budget request for Fiscal Year 1987. A few summary statistics provide a broad outline of the SWPA's projected financial request.

	Adjusted FY 1986*	FY 1987	Difference
Total Budget	$37,954,000	$ 38,580,000	$+ 626,000
Available Prior Balances (Carryover Funds)	$-8,774,000	$-13,243,000	$-4,469,000
Appropriations	$29,180,000	$ 25,337,000	$-3,843,000

* FY 1986 appropriations have been reduced by $320,000 in administrative areas.

The proposed $626,000 increase in the budget represents a rise of only 1.6 percent. More importantly, due to carryover funds, I am asking for a $3,843,000 decrease in the SWPA's annual appropriations. The $13,243,000 deferral of unused purchase power funds and operations and maintenance funds resulted from a combination of factors. Generous rainfall in FY 1985 led to favorable hydroelectric energy production thereby significantly reducing the need for power purchases. In addition, SWPA sold its Western Loop transmission facilities in FY 1985 producing a $2,000,000 savings in previously appropriated maintenance funds. The SWPA's FY 1987 appropriation request will continue an efficient and effective program consistent with the National Energy Policy Plan.

MISSION

Southwestern Power Administration (headquartered in Tulsa, Oklahoma) markets hydroelectric power generated at Federal dams, at cost-based rates, in a manner consistent with sound business principles, giving preference in the sale to public bodies and cooperatives. SWPA schedules the operation of the Corps of Engineers' generating facilities and operates SWPA's transmission facilities in a safe, reliable manner, consistent with good utility practice. SWPA facilitates the development of environmentally clean, renewable resources and energy conservation practices.

STAFFING

The requested FY 1987 staffing level is 186 FTE positions, the same as FY 1986.

FY 1987 BUDGET INFORMATION

SWPA's total budget falls into three general categories: (1) Purchase Power and Wheeling, (2) Operation and Maintenance, and (3) Construction.

	Adjusted FY 1986	FY 1987	Change
Purchase Power and Wheeling	$21,624,000	$20,959,000	$-665,000
Operation and Maintenance	10,874,000	11,802,000	+928,000
Construction	5,456,000	5,819,000	+363,000
Total Budget	$37,954,000	$38,580,000	$+626,000

I will summarize the major factors behind the proposed figures in each of these categories.

(1) Purchase Power and Wheeling

When the Federal system fails to generate enough hydroelectric energy to meet contractual obligations, as is the case during drought conditions, SWPA must purchase energy from other sources. Certain SWPA contracts also require routine purchase of energy on a reimbursable basis regardless of rainfall. In addition to purchasing energy, the agency pays for transmitting, or wheeling, power over facilities owned by other utilities.

The proposed $20,959,000 budget for purchase power and wheeling costs is a reduction of $665,000 from FY 1986. The reduction is due, in part, to a change in the method of estimating these costs. The FY 1986 budget was based upon needs for five months of critical water conditions, whereas the FY 1987 budget proposal will take care of needs for an entire year under average water conditions. Although the total amount has changed only slightly, the new approach better represents the routine purchase needs and the drought purchase needs, and is compatible with similar projections used in SWPA's repayment studies. As explained later in my statement, this portion of the budget will be reduced further over the next several years.

(2) Operation and Maintenance

Operation and Maintenance includes the power marketing program, operation of the transmission system, maintenance of all physical facilities, and general program management. The FY 1987 budget proposal in this category represents an increase of $928,000, or 8.5 percent, over the current year. Included are built-in increases of $192,000 for pay costs and benefits, a net increase of $647,000 in various other expenses including rent and service contracts, and $89,000 due to the administrative reduction reflected in the adjusted FY 1986 Operations and Maintenance amount.

(3) Construction

The proposed $5,819,000 budgeted for Construction activities in the coming year is an increase of $363,000 or 6.7 percent, over FY 1986. Some construction of transmission facilities is necessary to make the Government's system compatible as utilities interconnected to the SWPA's main grid modify and upgrade their facilities. The need to accommodate increasing customer loads also adds modestly to the rise reflected in this proposal.

CURRENT FINANCIAL STATUS

I am pleased to report to this Committee that SWPA is in good financial condition. All available power is under contract and is widely distributed among the six states. We experienced excellent rainfall during FY 1985 which, when coupled with sound rate levels, produced revenues in excess of $120,000,000. We also completed FY 1985 with a large amount of hydroelectric energy stored in our energy banking accounts. The combination of this stored energy and the heavy rainfall filling the system's reservoirs to maximum capacity during the first quarter of FY 1986 placed SWPA in an excellent position to meet winter peak loads and continue its recent financial success. SWPA met its repayment obligations for the fourth straight year, in addition to paying all operation, maintenance, interest, and administrative costs. The amount repaid on principal in FY 1985 was $39,700,000, bringing the agency's cumulative repayment to $102,000,000 on a total repayable investment of $839,000,000, or 12 percent.

RATES

Timely rate increases have helped SWPA maintain its good financial standing. The Deputy Secretary of Energy approved, on an interim basis, a one percent rate increase for SWPA's integrated system effective October 1, 1985, through September 30, 1989. Confirmation and final approval by the Federal Energy Regulatory Commission is pending.

REDUCTION IN ENERGY PURCHASE REQUIREMENTS

Beginning in FY 1984, SWPA reported to this Committee its intention to convert Full Load Factor power contracts, scheduled to expire in FY 1985, FY 1986, and FY 1987, to 1200-hour per year peaking power contracts. These ongoing conversions reduce the Government's annual energy obligations, and result in a corresponding savings in appropriation requests estimated to be $2,200,000 for FY 1985, $4,500,000 for FY 1986, and $6,900,000 for FY 1987. SWPA has also converted a number of borderline contractual arrangements to allow customers to pay suppliers directly for energy previously paid by SWPA through appropriations. These new arrangements promise to reduce SWPA's appropriation needs by an estimated $1,900,000 for FY 1985, $7,200,000 for FY 1986, and $8,100,000 for FY 1987.

HYDROPOWER DEVELOPMENT

SWPA, working closely with the U.S. Army Corps of Engineers, achieved a historic first by contracting with the Sam Rayburn Municipal Power Agency for the 100% non-Federal financing of the Town Bluff hydropower project in Southeast Texas. Other non-Federal entities have shown an interest in financially sponsoring other Federal hydroelectric projects in SWPA's service area. Potential development amounts to about one million kilowatts, which would be equivalent to 49% of SWPA's generating capability. Although there now is a power surplus in our service area, the additional hydroelectric generation now under consideration could be brought on line in time to meet projected regional energy needs in the early to mid 1990's.

TRANSMISSION UTILIZATION

The Government's transmission system is extremely important, particularly in the manner in which it operates as part of the Southwest Power Pool, and is used by customers to transmit or wheel power. This sharing helps eliminate expensive duplication of facilities and thereby improves the economic condition of all parties. The constantly changing load patterns and economic exchanges of power do, however, require some modifications and additions to the Government's transmission facilities. As facility sharing continues, SWPA will explore arrangements to jointly finance modifications and additions to the Government's system. We are proceeding with this approach in the Southeast Missouri-Northeast Arkansas area and from Oklahoma through the Kansas area for possible north-south power exchanges with Western Area Power Administration and other utilities.

FACILITIES MANAGEMENT

During FY 1985, SWPA sold 277 miles of excess 138 and 69 Kv transmission lines, along with several substations and switching stations, known collectively as the Western Loop. The sale to Western Farmers Electric Cooperative was for $9,300,000; the Government investment was $6,100,000. Another accomplishment in the area of facilities management was the moving of two maintenance units from leased facilities in Muskogee and Ada, Oklahoma, to SWPA owned buildings in Gore and Tupelo, Oklahoma. The savings in lease payments at the former locations will completely pay back construction expenses of the new structures in less than ten years.

In conclusion, Mr. Chairman, SWPA's budget proposal for FY 1987 provides for the continuance of a dynamic program at a stable funding level. We have taken significant steps to reduce appropriation requests. SWPA remains committed to operating in a businesslike manner and maintaining rates sufficient to return all operating costs, along with the principal and interest associated with the construction of power generation and transmission facilities, to the U.S. Treasury. We appreciate the cooperation and recognition provided by the members of this Committee. I am privileged to serve as Administrator and work with your Committee, as well as with the customers and employees of the Southwestern Power Administration.

BIOGRAPHICAL SKETCH

RONALD H. WILKERSON

Ronald H. Wilkerson was appointed Administrator of Southwestern Power Administration (SWPA) on July 29, 1984 by the Secretary of Energy.

Headquartered in Tulsa, Oklahoma, SWPA is a regional agency of the U.S. Department of Energy (DOE) with responsibility for marketing Federal hydroelectric power in Kansas, Missouri, Oklahoma, Arkansas, eastern Texas, and Louisiana. SWPA's wholesale customers are 10 generation and transmission cooperatives, 45 municipal electric systems, and three military installations.

As Administrator, Wilkerson is responsible for marketing the output of 23 Federal hydroelectric projects at the lowest possible cost while fully repaying the Federal investment with interest. These projects have installed capacity of 2,150,350 kilowatts and generate an average of 5.6 billion kilowatt-hours of energy annually. Sale of power produces revenue of approximately $100 million annually against a budget of $38 million.

With about 190 employees at five locations, SWPA operates and maintains 1,400 miles of transmission lines and 26 substations in addition to scheduling and dispatching the power.

Prior to his appointment, Wilkerson was Manager of the Upper Columbia Area for the Bonneville Power Administration (BPA), a regional power marketing agency under DOE in the Pacific Northwest. He was responsible for BPA activities in eastern Washington, northern Idaho, and western Montana.

Arriving at BPA in 1961, Wilkerson progressively held more responsible positions within that organization resulting in extensive experience and expertise in the areas of customer service, power marketing, and engineering. This included serving as BPA District Manager in Kalispell, Montana, as well as assignments in Idaho Falls, Idaho; Seattle and Walla Walla, Washington; and The Dalles and Portland, Oregon.

Wilkerson is a Registered Professional Engineer, a member of the Institute of Electrical and Electronic Engineers, and serves on the Board of Directors of the Southwest Power Pool. He has received numerous awards for special acts and performance. A native of Montana, he received his Electrical Engineering degree from Montana State University.

Wilkerson and his wife, Sharon, have three sons and a daughter.

January 1986

SALE OF EXCESS PROPERTY

Chairman HATFIELD. Thank you, Mr. Wilkerson.

I noticed in your testimony that you indicated that you had sold some excess transmission lines in 1985 at a pretty handsome profit. Is that correct?

Mr. WILKERSON. That appears to be correct. That property was disposed of through the General Services Administration in accordance with the procedures that they have established, and it is my understanding that the original cost for those facilities was in the neighborhood of $6 million, and the selling price was in the neighborhood of $9 million.

Chairman HATFIELD. What is the replacement cost for that? What would that be approximately, do you know?

Mr. WILKERSON. I really am not familiar with that.

Chairman HATFIELD. Could you provide that for the record?

SALE OF EXCESS TRANSMISSION LINES

Mr. WILKERSON. I can supply that for the record. General Services Administration, perhaps, will have that information for us.

[The information follows:]

The replacement value of the western loop was estimated to be $40 million.

Chairman HATFIELD. It is sort of a benchmark, is it, for other sales that you would hope to realize such profits from, Madam Secretary?

Miss FITZPATRICK. We have no position on that, Mr. Chairman. No, our guideline for the sale price of the PMA's is basically the outstanding unpaid Federal investment.

HARRY S. TRUMAN DAM, MO

Chairman HATFIELD. Mr. Wilkerson, what is the status of the Harry S. Truman project?

Mr. WILKERSON. That project, as you know, Mr. Chairman and members of the committee, has been controversial, because it included a pumped storage feature which had an effect of killing fish. The project's construction is completed, with six units installed. The Corps of Engineers completed late last year some studies looking for alternative ways to resolve the fish problem and other environmental problems that they experienced downstream.

Currently, we are operating the project with four units, which is what the Corps of Engineers has allowed us, with operation at a higher level during power emergencies, if such should come along. The Corps of Engineers, we understand, is continuing to work toward the testing and eventual operation of all six units, and we are hoping that they will be successful in that. They are also continuing to seek ways of resolving the fish kill problem, and I am pleased that the Corps of Engineers is working toward the full planned capability of that project. But it isn't here yet.

Chairman **HATFIELD**. I understand. Thank you.

We will have other questions to submit to you for the record.

[The questions and answers follow:]

QUESTIONS SUBMITTED BY CHAIRMAN HATFIELD

Southwestern Power Administration (SWPA)

Question: Describe Southwestern's efforts to develop new sources of Federal hydro power with private interests, and what is the potential for such development?

Answer: The Corps of Engineers has identified 20 projects in the SWPA area where development of hydroelectric generating facilities appears to be financially feasible. The proposed capacity for these projects total over 1 million kW. There appears to be much interest in non-Federal financing of such developments. FERC study permits have been granted to non-Federal interest on several of these projects and FERC construction licenses have been granted on some.

SWPA is prepared to facilitate the development of these resources and has made potential developers aware of this through meetings in our six state area of operations.

In many instances the project can be enhanced (more usable or dependable) when operated in conjunction with other hydroelectric projects in SWPA's system whether the project is constructed by the Corps of Engineers or by another party through a FERC license.

Question: Briefly, what projects are most mature, and what construction and financing arrangements are contemplated?

Answer: The most mature projects would include:

1. The W.D. Mayo project on the Arkansas River: This project involves the addition of hydroelectric generating facilities with an installed capacity of 33,000 kW to an existing navigation structure and would be financed, designed, and constructed by the Cherokee Nation with approval of the Corps of Engineers. Upon completion, the title to the project would be transferred to the Corps of Engineers and they would then own, operate, and maintain the facilities. The SWPA would market the power generated and would repay the Cherokee Nation its costs plus a royalty for its services. In addition, SWPA would repay the Corps of Engineers for its operation, maintenance and replacement costs. This project is the subject of legislation and is included in HR 6 and S 1567 which are under consideration.

2. The KAW reservoir project on the Arkansas River: This project involves the addition of a 34,000 kW hydroelectric generating facility to an existing Flood Control structure. The facilities would be built under a FERC license and would be constructed, owned, operated, and maintained by the licensee. SWPA would enter into a power pooling arrangement with the license under which the project would be operated as part of the SWPA interconnected system and both the licensee and the

Government would share in the project enhancement resulting from such pooling operation.

3. The Fort Gibson Dam Project on the Grand River: This project involves the addition of two hydroelectric generating units totaling 22,500 kW to an existing multiple purpose hydroelectric facility. It is contemplated that the Grand River Dam Authority (GRDA) would finance the construction of the additional units. Further, GRDA would enter into a pooling arrangement with SWPA where GRDA would receive the generation from the additional units and operate the project in its system of reservoirs and GRDA and SWPA would share in the project enhancement from such operation.

4. The Denison Dam Project on the Red River: This project involves the addition of two hydroelectric generating units totaling 70,000 kW to an existing multiple purpose-hydroelectric facility. It is contemplated that preference customers would finance the construction of the additional units. The facility would be constructed, owned operated and maintained by the Corps of Engineers. SWPA would reimburse the financier its costs and would repay the Corps of Engineers for its costs of operation, maintenance, and replacement.

PURCHASE POWER

Question: The largest single item in your budget is the $21 million requested for Purchase Power and Wheeling. What is the basis and need to purchase so much electricity each year?

Answer: The $21 million Purchase Power and Wheeling budget item provides for the funding of etimated amounts of energy purchase necessary to meet the Government's commitments to our utility customers under various sales contracts. In this regard, the hydro energy marketed by Southwestern must be supplemented by energy purchases to enable us to fulfill our contractual obligations, particularly, under adverse, low water conditions. Further, we have other contractual arrangements to deliver power and energy to customers not directly connected to the transmission system and to pay resulting transmission wheeling expenses. None of our energy purchases are discretionary; however, water conditions affect whether additional hydroelectric energy can be generated to meet the obligation or whether energy purchases are required.

Our projection of needs for the FY 1987 Purchase Power and Wheeling budget is based on meeting our customers' contractual requirements under average year water conditions. Estimates of Purchased Energy needs for budgetary purposes are based on a variety of continually changing elements. Among these elements are: (1) unit prices for direct purchased energy (generally based on fuel costs; (2) quantities of energy needed to fulfill customer needs (both direct and borderline); and (3) unit prices and transmission rates for borderline purchases which are affected by both fuel costs and rate increases proposed by companies providing supplemental energy.

Question: What portion is based on water levels and what portion is other contractual arrangements?

Answer: Of the $21 million, approximately $7 million is based on water conditions for system support and $14 million is based on contractual requirements.

Question: What is being done to hold Purchase and Wheeling cost to the lowest possible level?

Answer: Southwestern utilizes extensive energy banking arrangements to minimize direct purchases of energy. We are also continuing to convert expiring contracts from high energy commitments to lower energy commitments, thus reducing the Purchase Power and Wheeling Budget levels. In FY 1987 the effect of this conversion is a reduction of about $7 million in average year budget requirements. We have also pursued conversion of certain other contractual arrangements which require us to purchase energy from the Oklahoma Companies to meet customer loads, and receive reimbursement of such costs from the customers. While such an arrangement produces no net costs for the Government, we must request appropriated funds. A concerted effort is being made to provide for direct payment by the customers to the Oklahoma Companies to reduce budgeted funds. In FY 1987 this conversion will result in a decrease of about $8 million. The total reductions from these two actions is $15 million in FY 1987. Southwestern will continue efforts to derive new ways of reducing budget requirements.

HARRY S. TRUMAN HYDRO PROJECT

Question: Bring the Committee up-to-date on the operational status of Harry S. Truman hydro project. What is being done to make the plant fully operable given the environmental constraints?

Answer: We are continuing to work closely with the Corps of Engineers in an effort to make the hydroelectric plant fully operational. The pump back feature will not be used until such time that provisions can be incorporated to eliminate the possibility of massive fish kills. In the interim, additional storage for power use would be helpful. However, the Corps cannot find economic justification for providing additional storage even though SWPA customers have indicated a willingness to pay for that storage. The need to generate with all six units on a regular basis is important. The Corps in cooperation with the state and downstream interests is conducting a long term study to determine the impacts of generating with first 5 and then 6 units. The idea is to proceed very cautiously so as to minimize downstream impacts.

Question: How is the Federal hydro investment being recovered?

Answer: The investment allocated to the power purpose at the Harry S. Truman project is recovered through the rates charged by SWPA for the sale of power and energy from its total system of projects. The rate making practices of the Power Marketing Administrations provide that the investment in new facilities under construction, such as Harry S. Truman, be amortized beginning with the date they are placed in service. Consequently, all costs associated with the project are being recovered under current rates. However, under the Corps of Engineers limited operation criteria, we are able to market much less capacity than planned and this condition requires sales from other system projects to provide additional revenues to recover the investment at the Harry S. Truman project.

TRANSMISSION STUDIES

Question: The Committee understands that SWPA has been involved in a transmission study in Kansas. What is the purpose and status of the study?

Answer: SWPA has been a participant in two related transmission studies involving the State of Kansas. These studies were the Kansas Joint Transmission Study and the Western/Southwestern Intertie Study. In the spring of 1984 the Western Area Power Administration (Western) was requested by the Kansas Congressional Delegation to explore alternatives for delivery of Federal preference power to the load centers in Kansas at the most reasonable cost. During the same period of time, Western and Southwestern Power Administration (Southwestern) were expressing an interest in exploring alternatives as to allow beneficial transfers of energy between both agencies. As a result of the Kansas Congressional Delegation's request and the expressed interest in exploring beneficial exchanges, Western and Southwestern initiated the two studies.

The purpose of the Kansas Joint Transmission Study was to determine the transmission facilities required to accommodate delivery of Federal preference power by Western into Kansas and to determine the transmission facilities required to accommodate resource exchanges between the two agencies. This study involved the two agencies and 13 utility systems. The study was completed in February of this year.

The purpose of the Western/Southwestern Intertie Study was to investigate the possibility of capacity and energy exchanges between Western and Southwestern. This study involved only Western and Southwestern. The study was completed in February of this year.

Question: Have any results or conclusions been made? If so, please explain.

Answer: The Kansas Joint Transmission Study concluded that the existing bulk transmission system owned by the various utility systems could accommodate the Federal Power and Energy transfers simulated in the study provided certain improvements were made to the subtransmission systems. The Western/Southwestern Intertie Study concluded that, using a banking concept, resource exchanges between the two agencies would allow each agency to market additional capacity from their systems.

An economic analysis of the conclusions reached by the two studies was just completed. This analysis identified two resource exchange levels with benefit to cost ratios greater than one. These resource exchange levels were 100 MW and 200 MW. The analysis recommended that Western and Southwestern now identify a mutually agreeable exchange program with equitable cost-sharing arrangements.

Question: What is the estimated cost to carry out these conclusions, and what is the optimum schedule for undertaking this work?

Answer: Transmission costs associated with the two levels of resource exchange with benefit to cost ratios greater than one were 5.3 million dollars for the 100 MW level of exchange and 11.7 million dollars for the 200 MW level of exchange. No schedule has been developed at this time for undertaking this work.

Question: In your judgment, given the ongoing effort to de-Federalize the PMA's, is this something that should proceed on a fast track?

Answer: The ongoing effort to de-Federalize the PMA's should not be a factor in establishing a schedule to carry out study conclusions. These conclusions should be implemented using sound planning practices giving appropriate recognition to the scope and complexity of the required work.

REPAYMENT REFORM

Question: What impact will the proposed change in your repayment process have on your power rates?

Answer: Based on Total Gross Revenue projected in the FY 1987 Budget the anticipated increase in rates as a result of the Repayment Reform Proposal follows:

	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990	FY 1991
Rates (Mills/kwh) Peaking Power	27.5	30.5	31.1	32.0	32.0	32.0
Percentage (%)	0	11	13	16	16	16

PROCUREMENT RESTRICTIONS

Question: As you know, the fiscal 1986 appropriations act contains a 25 percent price preferenc eon procurement of EHV equipment which is manufactured in the U.S. Assuming these restrictions apply, please list each fiscal 1986 procurement for your agency that has been, or will be, affected by the restriction, and the amount of each procurement. Explain the impact of the restriction on the procurement using both the definition of EHV equipment contained in the Statement of Managers accompanying the Conference Report on H.R. 2959 and the definition contained in the statement on the floor of the Senate during consideration of the Conference Report on H.R. 2959.

Answer: To date Southwestern has not procured, nor does it plan to procure, any extra high voltage equipment in FY 1986 under either definition of EHV equipment.

Question: If the same restriction were continued in fiscal 1987, please list each anticipated procurement, and explain the impact of the restriction on the procurement. Provide the same type of information for the period 1988-1992, assuming the restriction were continued for your agency. Again, answer the questions separately for each definition of EHV equipment.

Answer: Southwestern's projected EHV Procurements for FY 1987 and the period 1988-1992 is as follows:

TABLE 1

PROJECTED EHV EQUIPMENT PURCHASES FOLLOWING STATEMENT ON FLOOR OF SENATE CONFERENCE REPORT 2959

(Dollars in Thousands)

NONE

TABLE 2

PROJECTED EHV EQUIPMENT PURCHASES FOLLOWING MANAGERS STATEMENT CONFERENCE REPORT 2959

(Dollars in Thousands)

Type of Equipment	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990	FY 1991	FY 1992
Transformers	0	300	900	*	*	*	*
Series Capacitor Banks	0	200	325	*	*	*	*
Power Circuit Breakers	0	0	0	*	*	*	*
Relays	0	72	300	*	*	*	*
Tapered Tubular Steel Structures or Structural Units	0	0	0	*	*	*	*
Total	0	572	1,525	*	*	*	*

* Planning projections not available for these outyears since engineering details are not final.

Question: How much EHV procurement has your agency undertaken in the last five years (fiscal 1982-1986)? Please list each procurement that would have been affected by the restriction, identify the successful bidder, and specify the dollar amount of the contract awarded. Again, answer the questions separately for each definition of EHV equipment.

Answer: Following are tables listing the EHV equipment procurements in the last five years. All the EHV equipment procured in the last five years is listed. There would have been no impact to Southwestern if the Buy American restrictions had been in effect. Table 1 lists the EHV equipment in accordance with the definition provided by the Senate in the October 26, 1986 Congressional Record, that is, equipment rated at and operating above 242-kilovolts and less than 1000-kilovolts. Table 2 lists EHV equipment as defined by the House Conference Report on U.R. 2959.

TABLE 1

Power Circuit Breakers and Power Transformers
Rated 242-kV and Above

NONE

TABLE 2

Power Circuit Breakers and Power Transformers, Relays
and Other Equipment Defined as EHV per H.R. 2959

Contract Number	Equip	Contract Manufacturer	Price
FY 1982			
82SW13015	OCB	General Electric	$262,329
FY 1983			
NONE			
FY 1984			
84SW15018	Capacitor	C. B. Anderson	$ 12,658
84SW15736	Relay	Westinghouse	$ 2,472
84SW17144	Capacitors	Robinson Electric	$134,877
84SW15812	Transformer	Westinghouse	$369,940
FY 1985			
84SW17241	Capacitor	Trench Electric	$ 9,580
85SW17801	Meter	Scientific Columbus	$ 73,402
FY 1986			
NONE			

Question: Please identify the American manufacturers of EHV equipment. In your opinion, are there sufficient American EHV manufacturers to offer competitive bidding in EHV equipment procurement? Answer the questions separately for each definition of EHV equipment.

Answer: Based upon our bidding experience, we believe that Southwestern has received competitive bid proposals from American Manufacturers. I would like to insert for the record a table showing domestic EHV manufacturers.

(The information follows:)

Domestic EHV Manufacturers

EHV Equipment	Domestic Manufacturers
EHV Power Transformers	General Electric (GE)
EHV Power Circuit Breakers	Westinghouse, McGraw Edison
EHV Reactors	No Domestic Manufacturers
HVDC	GE

ALASKA POWER ADMINISTRATION

STATEMENT OF ROBERT J. CROSS, ADMINISTRATOR

Chairman HATFIELD. Mr. Robert Cross, Administrator of the Alaska Power Administration, I believe, has a statement that we will put in the record. If you would highlight it, we would appreciate it.

Mr. CROSS. Thank you, Mr. Chairman, and I will be very brief, except for one point. Did I understand you to say that you were planning on relinquishing the Chair of this committee after this year?

Chairman HATFIELD. Oh, I am not prepared to finalize that decision. It depends on a lot of other things that happen, that may happen in November. [Laughter.]

Mr. CROSS. I hope very much that it is not the last time that we will have a chance to get your guidance on things you have helped us with so much. It was shocking to me when I heard it, and I hope I heard it wrong.

Chairman HATFIELD. Mr. Cross, you have been a very great counselor of this committee and all you other gentlemen. I think you probably have the seniority on all of your colleagues in terms of the number of times you have appeared before this committee. You have always been very helpful, and we are very grateful.

BUDGET PROPOSAL

Mr. CROSS. Mr. Chairman, our 1987 request will continue the operation and maintenance program of the Alaska Power Administration at the current level, financed partly from a deferral from the 1985 balances. The deferral does reflect some favorable cost experiences in the last couple of years. It is not a curtailment of programs in any way, shape, or form.

We also have available to us the full amount of the emergency fund that was established in 1984. I believe the programs are progressing in a satisfactory fashion as measured by sales and revenues. Progress on the operation and maintenance objectives, perhaps, is the most complex. The major piece of work right now is completion of our automation project, the Eklutna powerplant, which, when completed, will produce rather significant manpower savings before the end of 1987.

NET BILLING PROCESS

There are two items which I would like to mention. We have utilized for the last several years a process of net billing the cost of non-Federal personnel to handle operation and maintenance of the Snettisham project. When we complete the Eklutna automation, we expect to make similar arrangements with one of our customers in the Anchorage area.

We are estimating total net billing amounts in 1987 of 3.8 percent of revenues. If we did not net bill, we, of course, would have to ask for appropriations to cover those costs.

My last point is, we have completed a joint study with the State of Alaska on issues involved with the proposed sale of the Alaska Power Administration project. As was mentioned early on in this hearing, we expect that report to be available next month and plan on furnishing it to your committee. After working quite some time on that issue, I still think that sale of the Alaska Power Administration makes a great deal of sense and that we should pursue it and get that job done.

I would be happy to answer questions, sir.

[The statement follows:]

STATEMENT OF ROBERT J. CROSS, ADMINISTRATOR, ALASKA POWER ADMINISTRATION

Mr. Chairman and Members of the Committee:

I would like to give your committee a brief progress report on the Alaska Power Administration (APA) and a summary of our budget request for FY 1987.

PROGRAM OVERVIEW

APA is responsible for operation, maintenance, transmission and power marketing for the two Federal hydroelectric projects in Alaska. These are the 30 MW Eklutna Project serving Anchorage and surrounding areas, and the 47.6 MW Snettisham Project, which is the main power source for Juneau, Alaska's Capitol City. The two projects now provide roughly 8% of the energy requirements for Alaska's electric power utilities, with the balance coming from utility-/and State-owned plants.

In earlier years, APA carried out planning work on future power supply and transmission programs. The planning work has been phased out because the State and local utilities now have sufficient resources to do the necessary studies without further Federal involvement.

We maintain our headquarters office in Juneau with field offices at each project for the operation and maintenance work. Our staffing request is 38 FTE's, the same as for FY 1986.

An expansion of the Snettisham Project is now underway by the Corps of Engineers which has design and construction responsibility for that project. The new construction is the Crater Lake Unit which will add 34.5MW at a cost of about $58 million. Power on line is estimated in late 1988.

CURRENT ACTIVITIES

I am pleased to report that both projects are in good condition. I believe our current maintenance levels are adequate to assure good protection of the investment and continuity of service.

We have underway a project to modernize and automate the 31-year old Eklutna powerplant. This will allow us to shift from a fully-attended plant to remote operation by supervisory control. We have estimated that the manpower savings will pay for the new equipment within about 3 years. The new system is scheduled for completion in 1986, and we expect to complete the shift to remote operation in FY 1987.

Other current activities include a program to replace PCB transformers, replacement of one of the turbine runners at Eklutna, and continuation of a fairly intensive transmission line maintenance program started three years ago for Snettisham Project.

For 1985, we marketed 309 million kilowatt hours with gross revenues of $6,866,000. We are estimating sales of 336 million kilowatt hours with revenues of $7,732,000 for FY 1986.

Our appropriation level has been fairly steady in recent years -- $3,233,000 in 1985 and $3,245,000 in 1986. The latter number reflects the adjustment under Gramm-Rudman-Hollings.

NET BILLING

We have used net-billing arrangements for wheeling of Snettisham power over non-Federal transmission lines and for an operations contract which provides utility operators for Snettisham. The actual amount net-billed in FY 1985 was $205,000, or 3% of revenues.

We plan to develop a similar operations contract for Eklutna after the automation project is complete. Operations would be handled remotely by one of our utility customers. We also propose to use net-billing for our costs under the contract. We are estimating net-billing amounts of $350,000 in 1987 (total of both projects), or 3.8% of projected 1987 revenues.

The President's FY 1986 Budget included a proposal that the Alaska Power Administration projects be sold to the State of Alaska or other non-Federal ownership.

This idea makes sense for many reasons. The two APA projects constitute a fairly small part of the power supply and transmission facilities in Alaska. Both are essentially single-purpose power developments with all costs allocated to power. The State has its own Alaska Power Authority with capability to plan, design, finance, and construct hydroelectric and other power facilities. The APA customers operate both generation and transmission facilities. APA serves in only one state. There is just no longer a need for a separate Federal power program in Alaska.

For the last several months we have been working with the Alaska Office of Management and Budget and other interested parties on a joint study of the issues surrounding the proposed sale. We expect to finalize a study report in March and hope that report can provide much of the information needed to develop specific decisions and legislative recommendations on the proposed sale.

The study has not turned up anything which looks like an insurmountable obstacle. There is a lot of concern about potential rate impacts and there will be differing opinions on what the sale price should be. All parties recognize that Federal legislation authorizing the sale will be needed.

The transfer initiative would further the NEPP IV Objectives of minimizing Federal control of energy production. It would strengthen local capability to handle future power needs in Alaska.

FY 87 BUDGET REQUEST

We are requesting new appropriations of $2,881,000 to continue our power operation, maintenance, and marketing programs. Our request also anticipates use of $400,000 deferred from FY 1985 balances for a total program of $3,281,000. This is the same as the FY 1986 appropriation level.

The request contemplates $2,459,000 for normal, continuing operations and maintenance functions, including $440,000 for major replacement and maintenance items. This includes completion of the program to replace PCB transformers and continuation of the summer maintenance program on the Snettisham line. The balance of the request -- $822,000 -- covers all administrative and management costs for APA.

As mentioned earlier, we propose to continue net-billing arrangements for the operations contract and wheeling at Snettisham and to establish a net-billing arrangement for operations at Eklutna.

FY 1987 sales are estimated at 338 million kilowatt hours with revenues of $9,310,000. The revenues include a $737,000 increase due to the proposed modified repayment criteria.

Finally, we have emergency funds in the amount of $200,000 made available in the FY 1984 Appropriations Act. Fortunately, we have not had to use any of these funds. Our request contemplates that these funds will remain available for use in FY 1987. We believe this remains an appropriate level of emergency funding for our programs.

I would be happy to answer questions and provide additional data to your Committee as needed.

Thank you.

Biographical Notes -- Robert J. Cross

Mr. Cross was appointed Administrator of the Alaska Power Administration in June 1976. He has been on the Alaska Power Administration (APA) staff since the agency was formed in 1967. He was a staff engineer in the APA Planning Division between 1967 and 1973, and Planning Division Chief from 1973 to 1976.

Mr. Cross entered Federal Service in 1956 as a hydraulic engineer with the Bureau of Reclamation. Between 1956 and 1967, he had planning assignments with Reclamation in Colorado, Wyoming, Nebraska, and Alaska with a 2-year break for active service in the U. S. Army.

Mr. Cross is 52, and a native of Lincoln, Nebraska. He attended public schools in the states of Nebraska, Washington, and New York, and is a Civil Engineering graduate from the University of Colorado. Cross has been a resident of Juneau, Alaska, since October 1964.

Chairman HATFIELD. Thank you.

Could you bring the committee up to date on the joint Federal-State study on the sale of the Federal hydroelectric facilities in the State of Alaska?

Mr. CROSS. Yes, sir. We have worked rather intensely with the State and quite a few other affected people, customer groups and agencies involved in land management and so on, and we have completed a fairly thorough examination of the issues that we feel are important in the proposed transfer. It is that study and report that we expect to have available to furnish to the committee next month.

Chairman HATFIELD. In other words, you have not found any insurmountable problems that surround the sale, including, say, dropping oil prices, and Alaska is as interested as it once was? Or does that have any impact on this?

Mr. CROSS. It certainly has an impact on getting the attention of the people in Alaska, because their priorities mean cutting back on other programs. Whatever the thought is, the project would be financed by revenue bonds. It would not require appropriation of government money in Alaska. If that were to be worked out in that fashion, the falling oil prices may not slow us down at all.

Mr. Chairman, I would add with regard to your earlier statement that the study has not found insurmountable obstacles, I know there will be a lot of difference in opinions on what the proper price should be.

Chairman HATFIELD. Mr. Cross, can you make any predictions or projection as to when this might be completed?

Mr. CROSS. Mr. Chairman, I would offer two suggested timeframes. We would like to try to complete the work of obtaining a proposal within the guidelines that were discussed earlier and have it available for consideration by the Congress some time next year, with the thought that the sale might be completed by 1988 or 1989.

Chairman HATFIELD. Would that satisfy you over in the Department if we got that little sale?

Miss FITZPATRICK. Would it satisfy us, Mr. Chairman, or would we be happy about it? Mr. Chairman, we would be most happy to complete that sale, yes.

Chairman HATFIELD. Don't misread my support for this particular project.

Miss FITZPATRICK. I think we understand the chairman's position.

Chairman HATFIELD. Does the Senator from North Dakota have any questions for the Director of Alaska Power?

Senator BURDICK. No, I don't.

ADDITIONAL QUESTIONS FOR THE RECORD

Chairman HATFIELD. Mr. Cross, we will have additional questions for your response.

[The questions and answers follow:]

QUESTIONS SUBMITTED BY CHAIRMAN HATFIELD

Alaska Power Administration (APA)

Question: Can you give the Committee an idea of what impact the falling oil prices will have on the budget of Alaska?

Answer: The impacts on the State of Alaska are severe. The Governor prepared in January a FY 1987 State budget of about $2.6 billion. Forecasts at the time projected a small revenue surplus between now and the end of FY 1987. The latest State forecasts show approximately $1 billion less revenues for this fifteen month period than had been projected in January. Substantial cutbacks in State spending must be made.

Question: What is the total Federal investment in generation and related facilities for the Alaska Power Administration?

Answer: Our FY 1984 Financial Statements show a total Federal investment of $127 million.

Question: What would be the replacement cost of these facilities in 1986 dollars?

Answer: I would estimate the current replacement cost of our facilities at about $300 million in 1986 dollars. This is just a very rough estimate.

Question: Bring the Committee up-to-date on the joint Federal-State study of the sale of Federal hydroelectric facilities to the State of Alaska.

Answer: We have undertaken a joint study with the State on issues involved in the proposed sale. We expect to complete the study report and distribute it in April. The study received substantial input from affected agencies, the utilities who purchase power from us, as well as designated staff from the State legislature. We believe the study can provide an informative base to begin work on a specific sale proposal.

Question: Your statement indicates that the study has not turned up any insurmountable problems surrounding the sale. Briefly summarize the problems and the actions necessary to resolve those problems.

Answer: I would say that the questions on who should be the purchaser and what will be the sale price still have to be resolved. Considerable work remains concerning personal issues, land issues, the various contracts, and several agreements with non-power interests such as the hatcheries that depend on our power projects. We think each of the problems can be addressed in development of a specific sale proposal following the guidelines of openness, protecting the interests of the U.S. taxpayers, and recognizing the interests of our power customers and employees.

Question: What is the estimated economic impact on your service area of the proposed repayment procedures?

Answer: Our preliminary studies indicate an impact of about $700,000 per year for the Juneau service area in 1987, 1988, and 1989. We are estimating a 13.5% increase in our wholesale rates for that period. The increase at the retail level would be substantially smaller. I do not believe an increase of this magnitude would cause significant economic problems in the area.

PREPARED STATEMENT FOR THE RECORD

Chairman HATFIELD. We do have a statement on behalf of Senator Mattingly we will place in the record at this point.

[The statement follows:]

STATEMENT OF SENATOR MATTINGLY

Mr. Chairman, I join you in welcoming our witnesses from the power marketing agencies who are appearing before the subcommittee today. I have looked over their testimony, and am generally satisfied that—with only a few minor exceptions—these agencies are indeed performing their jobs as originally envisioned by the Congress in an effective, efficient manner. I know that in my area of the country, the Southeastern PMA has been successful in negotiating and renegotiating contractual agreements which will be beneficial to both the consumers and the Federal Treasury as well. I want to commend Mr. Geisinger, the Southeastern Power Administrator for the job he has done in achieving these results. Of course, I have to keep reminding him that he can't move from Elberton to Atlanta, but other than that we've gotten along pretty well.

We are all aware of the current debate as to whether Congress should or should not depart from the roles originally outlined for the PMA's and whether or not some or all of the revenue-producing assets should be sold to private industry or preference users, thus removing the Federal presence. However, I think that is a debate for a different forum and that we should be looking today at the needs of these agencies as originally constituted and commissioned by Congress.

Mr. Chairman, I may have a few brief questions which I will submit for the record at a later date. Thank you.

WESTERN AREA POWER ADMINISTRATION

STATEMENT OF WILLIAM H. CLAGETT, ADMINISTRATOR

Chairman HATFIELD. I would now like to ask the Administrator of the Western Region, Mr. Clagett, who also came from Bonneville Power Administration to his current post in Denver, to make his statement at this time.

Mr. CLAGETT. Thank you, Mr. Chairman.

I appreciate this opportunity to appear before the committee and represent the Western Area Power Administration.

Chairman HATFIELD. It is always good to see you.

Mr. CLAGETT. It is good to see you, sir.

THIRD AC TRANSMISSION LINE

I would like to summarize my prepared statement. The first item which I think is of interest to several people in this room is the so-called third ac transmission line. The project development agreement has now been signed by all participants for the development of the California portion of that intertie. That is a $27 million effort to do engineering and environmental work, and it is expected to take 2½ years to complete. This agreement provides for a future decision by these participants for the construction of the line.

PURCHASE POWER AND WHEELING

Next, I would like to mention purchase power and wheeling, which is a major part of our program. Of the $205 million of our fiscal year 1987 purchase power and wheeling budget, funded outside our revolving funds, $181 million of that is for the Central Valley project in California. We have had some difficulty in the past predicting water conditions; we have had, therefore, difficulty predicting what kind of appropriations we are going to need. That was a concern that you expressed last year.

Therefore, we have initiated something called bill crediting, which is a three-party agreement where some of our customers pay directly to some of our suppliers on those purchases. We expect this year to spend about $50 million through that mechanism. We have already completed some $16 million in bill credits.

WESTERN COLORADO TRANSMISSION FACILITIES

Another item in our construction budget is a transmission line in western Colorado, which involves three parties in the construction and operation of that line.

It was broken down into five segments. Two of those segments have now been completed and are energized. A third segment is under construction, and within the next 2 or 3 months, we expect contracts to be awarded for the last two sections. The project costs are essentially the same as originally envisioned. The only modification is the addition of a couple of phase-shifting transformers to assure full utilization of that facility.

CONSTRUCTION AND O&M PROGRAMS

Otherwise, the construction program and the O&M program for Western Area Power Administration is a stable program that represents the kind of program that I think most people expect of a system that consists of 16,000 miles of line, of which 8,000 miles are wood pole lines. Of those 8,000 miles of wood pole lines, about two-thirds are over 30 years old. So we have a constant program of replacing or upgrading these old lines in concert with the needs of other utilities in the area.

RATES AND REPAYMENT

The last item I would like to mention are rates and repayment. Last year, we had fantastic water; lots of water, and that means lots of generation. Consequently, we repaid Treasury $258 million on the outstanding debt for our system. That represented about 10 percent of the outstanding debt at the time.

We have no substantial rate increases anticipated in the near future, although we do have a couple of minor rate increases that we expect to start soon. We now have no rate actions before FERC.

Mr. Chairman, that summarizes my statement. I would be pleased to answer any questions.

[The statement follows:]

STATEMENT OF WILLIAM H. CLAGETT, ADMINISTRATOR, WESTERN AREA POWER ADMINISTRATION

Mr. Chairman and Members of the Subcommittee:

I am privileged to have the opportunity to discuss with you today the fiscal year (FY) 1987 budget proposal for the Western Area Power Administration (Western).

This past year has been extremely successful for Western, a situation which would not be possible without the support of this Subcommittee. As Western's Administrator, I look forward with enthusiasm to the challenges ahead. I believe the FY 1987 budget request will allow Western to meet those challenges, and help further the National Energy Policy Plan objectives of fostering an adequate supply of energy at reasonable costs consistent with sound business principles.

Mission, Organization, and Staffing

Western is a federally operated electric power marketing administration responsible for the delivery and sale of power to over 550 wholesale customers consisting of cooperatives, municipalities, public utility districts, irrigation districts, Federal and State agencies, private utilities, and reclamation project customers. The wholesale power customers, in turn, provide service to millions of retail power consumers in the States of Arizona, California, Colorado, Iowa, Kansas, Minnesota, Montana, Nebraska, Nevada, New Mexico, North Dakota, South Dakota, Texas, Utah, and Wyoming.

During FY 1987, Western will continue to be responsible for the operation and maintenance of over 16,490 circuit miles of transmission line, an estimated 242 substations, and various appurtenant power facilities in a 1.3-million-square-mile geographic area. Electric power marketed by Western will be generated at 51 hydropower plants operated by the Bureau of

Reclamation (BuRec), the U.S. Army Corps of Engineers (Corps), and the International Boundary and Water Commission (U.S. Section). Additionally, Western will market the United States 24.3-percent entitlement (547 megawatts) from the coal-fired Navajo Generating Station near Page, Arizona. The United States share of the installed generating capacity of all these powerplants will be 9,105 megawatts (MW).

The FY 1987 budget request for Western provides for a personnel staffing level of 1,379 full-time equivalents (FTE) to accomplish Western's objectives, the same as FY 1986.

I am pleased to report to the subcommittee that during the past several months we have, with the assistance of the General Services Administration (GSA), obtained permanent office and service center space for our Sacramento Area Office, Bismarck District Office, and the Electric Power Training Center. This essentially completes present space acquisition needs for our organization.

BUDGET HIGHLIGHTS

For FY 1987, Western is requesting $240.3 million in new budget authority, an increase of $44.5 million above the FY 1986 appropriation level. The funds are for construction and rehabilitation of transmission lines and associated facilities; system operation and maintenance expenses; and for purchase power and wheeling expenses. This increase is attributable to increased purchase power and wheeling costs for the Central Valley Project (CVP) in California, for power system facility replacements and additions, including consolidation of transmission facilities at the Hoover Powerplant in southern Nevada, and for adjustments in the allocation of Western's administrative and general expenses.

In addition to our request for new budget authority, we are requesting FY 1987 obligational authority of $82.0 million for the Colorado River Basins Power Marketing Fund (CRB Fund), established pursuant to Public Laws 75-529, 84-485, 92-370, and 90-537, a decrease of $4.6 million from FY 1986. This decrease reflects completion of construction work in FY 1986 for the Fort Peck-Havre 230-kV Transmission Line in Montana, as well as lower estimates for purchase power costs for fuel replacement energy. Under the CRB Fund, encompassing the Colorado River Storage Project (CRSP), the Fort Peck Project, and the Central Arizona Project (CAP), all operation and maintenance and power marketing expenses (including a portion of similar expenses incurred by the BuRec and the Corps) are financed from project power receipts collected by Western. Receipts above actual project operating expenses are returned to the U.S. Treasury to repay Federal investments.

Specific appropriation or fund amounts requested in FY 1987 compared to funds appropriated in FY 1986 are as follows:

BUDGET REQUEST SUMMARY
(Dollars in Thousands)

Appropriation or Fund/Activity	FY 1986 Adjusted Appropriation	FY 1987 Request	Change
Construction, Rehabilitation, Operation and Maintenance			
Construction and Rehabilitation	$ 79,165	$ 83,985	+$ 4,820
System Operation and Maintenance	74,477	86,172	+ 11,695
Purchase Power and Wheeling	72,500	113,690	+ 41,190
Subtotal (Program)	$226,142	$283,847	+$57,705
Use of prior year balances (net)	- 30,300	- 43,538	- 13,238
Subtotal, Construction, Rehab., Operation and Maintenance	$195,842	$240,309	+$44,467
Colorado River Basins Power Marketing Fund	86,627	82,000	- 4,627
Total, Budget Request	$282,469	$322,309	+$39,840

CONSTRUCTION AND REHABILITATION

The total FY 1987 construction and rehabilitation program requirement is $84 million, including $77.7 million of new budget authority and application of prior year balances of $6.3 million.

Improvements to Facilities

During FY 1985, work was completed on 16 substation additions, 23 miles of transmission line, the 200 MW Miles City AC-DC-AC Converter Station, and 1 communications system addition. In the current fiscal year, we plan to complete work on 18 substation additions, 5 communication system additions, and 3 operation and maintenance (O&M) service building additions. Also, over 370 miles of transmission line will be reconductored, rebuilt, or constructed in FY 1986.

Of the FY 1987 total program activity requirement of $84 million, $30.5 million or 36 percent is needed to complete work on 10 substation additions, 3 O&M service center additions, and 1 communication system addition. Also, approximately 400 miles of transmission line will be reconductored, rebuilt, or constructed in FY 1987. Work will continue on the Western Colorado 345-kV additions and other transmission line improvements and substation equipment additions.

The planned installation of phase-shifting transformers (PSTs) on the Long Hollow-San Juan 345-kV Transmission Line is coincidental with the Western Colorado 345-kV additions. Inadvertent (loop) flow has been a problem on the major transmission lines in the Western United States for years. These unscheduled flows reduce the effective capacity of transmission lines. They are a significant problem because utilities are unable to make full use of their transmission system.

With discontinuance of the Western Systems Coordinating Council Loop Flow Administrative Procedures, transmission systems must now accommodate 100 percent loop flow and have had actual flow exceed transfer capability before requesting assistance from member systems. Extensive studies have indicated that PSTs on the new Long Hollow-San Juan 345-kV Transmission Line and on the existing Lost Canyon-Shiprock 230-kV Transmission Line can alleviate some of the problems with inadvertent flows.

Discussions are underway with neighboring utilities to advise them of the effects of these installations and to explore the use of PSTs in other locations.

Approximately $41.1 million or 49 percent of the total requirement of $84 million is for new contract awards for 5 transmission line additions and improvements in 4 states, 7 substation additions, and 3 O&M service center additions.

About $12.4 million or 15 percent of the total requirement of $84 million will be used to continue studies for future facilities. Highlights of significant studies follow.

Studies for Future Facilities

The California-Oregon Transmission Project

Since the Congress approved the California-Oregon Transmission Project (Project) plan in the FY 1985 Supplemental Appropriations Act (Public Law 99-88), the Project Participants have approved a Project Development Agreement (PDA) that provides for up to $27.1 million in non-Federal funds for continuation of environmental studies, power system studies, land services, engineering analysis, and design activities. Western is a party to the PDA and is providing services on a reimbursable basis for the Project. Those services include environmental work required by the National Environmental Policy Act and engineering work associated with the upgrade of the Federal CVP facilities. Western completed transmission tower tests in December 1985 confirming the ability to convert the existing 230-kV towers to 500-kV in the 200-mile uprate section of the 330-mile project. Since the upgraded facilities will still remain an important integral part of the CVP, Western plans to use appropriated funds to proceed with negotiations for perfection of its existing easements along the existing 230-kV right-of-way upon completion of the environmental process. The Project has not adopted an official schedule for an inservice date, but the latest estimate is for mid-1991. With the recent determination that additional facilities would be needed in the south-central part of California in order to fulfill various commitments in the Project agreements, some delays in the Project may occur. Also, an indepth study of Project alternatives other than those described in the Project agreements has been suggested by one of the Participants which could result in Project delays. Western plans to begin the construction phase of the Project in FY 1988 on those elements of the Project for which we have construction responsibility, including substations at Redding and Tracy and the line upgrade. The portion of the Project for which Western is the construction manager is estimated at about $170 million, and will be totally funded with up-front financing by the other participants. We will keep the Subcommittee informed of our progress and the major developments.

The Pacific Northwest-Pacific Southwest Intertie

Mead-Phoenix DC Intertie (Phase I): Western, Salt River Project, the Southern California Public Power Authority, and the Modesto-Santa Clara-Redding Public Power Agency are the Project participants. Developmental work for the Mead-Phoenix DC Intertie is nearly completed and a commitment to construct is scheduled for the late 1986 to mid-1987 time period, with a scheduled inservice date of 1991 or 1992. Except for Western's planning expenses, the Project will be financed by non-Federal participants.

Mead-Adelanto DC Intertie (Phase II): The Mead-Phoenix Project participants are also planning possible reinforcement to the transmission system between southern Nevada and southern California. If built, this project will be interconnected with Phase I at Western's Mead Substation.

Mead-Northwest DC Intertie (Phase III): Western and interested entities have conducted extensive feasibility studies in both regions. In concert with 39 identified utility entities, Western will continue planning work in 1986, including preliminary technical studies, environmental review and contract negotiations.

The Manitoba Hydro Project

At the request of our customers, Western has been involved in discussions and negotiations with the Provincial Government of Manitoba (Manitoba) for a possible long-term power supply arrangement from a proposed Canadian hydroelectric powerplant on the Nelson River. Based on our customers' letters of interest in such an arrangement, Western and Manitoba have signed a letter of intent which outlines the basic sales principles. These principles state that Manitoba will build and sell the entire output of a proposed 1,275-MW hydroelectric powerplant for 35 years at a negotiated percentage of the average cost of the next two coal-fired thermal powerplants to be built in the Missouri River area. The proposed powerplant in Manitoba is scheduled to be placed in service between 1995 and 1998. Before the final contractual arrangements can be executed, Manitoba and Western's customers must agree upon the detailed costs and purchase percentage of the proposed thermal alternative. Studies to identify the costs and needed transmission facilities south of the Canadian border are currently underway. Any needed facilities would be financed by Western's customers.

Kansas Transmission Study

Western is involved in planning and power marketing activities to provide service from existing resources to eligible preference power customers in Kansas. In cooperation with the Southwestern Power Administration (SWPA) and other interested utilities, the planning study has been expanded to investigate a resource integration program between Western and SWPA to take advantage of hydrodiversity between the different river basins.

System Resource Integration Study

Western is currently engaged in hydrological and transmission system studies to determine additional opportunities for marketing and operating the Federal hydropower resources. Using the combined hydrology of all of the river basins in Western's control area, Western is examining the potential for additional firm power, sharing capacity reserves among operating areas to assure adequate generating capacity when adverse water conditions occur in one of the basins, and identifying transmission bottlenecks. This study work is scheduled for completion in early FY 1987.

SYSTEM OPERATION AND MAINTENANCE

The total FY 1987 O&M program activity requirement is $86.2 million, including $85.9 million of budget authority and application of prior year balances of $0.3 million. Our FY 1987 appropriation request for system operation and maintenance of $85.9 million includes $3.5 million of permanent appropriation authority for the Boulder Canyon Project. The increase of $11.7 million in total program activity requirements over Western's FY 1986 request is attributable to the continuing shift of Western's administrative and general expenses from the construction activity to the O&M activity, price increases for goods and services, higher costs of maintaining a power system at an acceptable industry-wide level of reliability and safety, and replacement and addition of equipment and transmission lines.

Of the FY 1987 program total, $68.5 million or 79 percent is for regular transmission system operation and maintenance expenses. This includes classified and wage board employee salaries, travel and transportation, rents, communications, utilities, materials and supplies, data processing, and administrative and general expenses.

In addition, $16.1 million or 19 percent is requested for power system replacements and additions necessary to maintain and improve system reliability, stability, and operational efficiency. This includes the purchase of telemetering, supervisory control, microwave, radio and protective relaying equipment, circuit breakers and transformers; the replacement and disposal of equipment containing polychlorinated biphenyls; the inspection of wood poles and the replacement of wood-pole transmission structures that have exceeded their useful lives; and the replacement of the telephone and data systems at Western's Headquarters and the Montrose District Office.

Hoover Consolidation

The Hoover Power Plant Act of 1984 authorized the uprating program at the Hoover Power Plant and modified the provisions of the General Consolidated Power Marketing Criteria or Regulations for Boulder City Area Projects. In order to meet these criteria, the existing Hoover Switchyard facilities will be modified and/or removed where possible so that the Hoover Power Plant units will tie directly to Mead Substation. Mead Substation will then become the delivery point for Hoover power. Field data, design, and circuit breaker and transformer procurement will be initiated during FY 1987 for Mead Substation and for transmission line modifications.

Public participation continues in developing the general regulations for the charges for the sale of power from the Boulder Canyon Project.

Marketing Plan Status

Considerable progress was made in the development of several marketing plans during this past year. I am pleased to report that criteria for two major marketing efforts have recently become final, and allocations pursuant to a third marketing effort have also been completed.

Final marketing criteria have been completed for the Western Division of the Pick-Sloan Missouri Basin Program and the Fryingpan-Arkansas Project, as well as for the Colorado River Storage Project, which will be integrated with the Collbran and Rio Grande Projects.

Contingent capacity and associated energy available from the uprate of existing Boulder Canyon Project generating units has been allocated to the State of Arizona, the State of Nevada, and to nine cities in the State of California. The final allocation, published in the Federal Register on November 20, 1985, will serve as a basis for contract negotiations with allottees in the months to come.

Fuel Displacement Activity

Western's fuel displacement activity (previously called the Oil Conservation Program) resulted in the displacement of the equivalent of approximately 7,701,810 megawatthours of energy in 1985. This is an increase of over 500,000 equivalent barrels of oil compared to 1984. Through this program, Western sells energy to utilities which would otherwise generate with more expensive nonrenewable resources, such as coal or oil.

Conservation and Renewable Energy

Western's customer conservation and renewable energy (C&RE) program was amended in FY 1985 to comply with Title II of the Hoover Power Plant Act of 1984. This action placed increased emphasis on the responsibility of Western's long-term firm-power customers to develop and implement effective C&RE programs as a condition of the firm power sales contract. Conversely, the need for technical assistance by our customers has also risen and has placed a greater emphasis on Western's customer service function as it relates to the changing conservation and renewable energy technologies. The customers' needs are being served in the form of equipment loans, cost-shared developmental studies, direct technical assistance, technical workshops, and C&RE-related technical resource publications.

The total C&RE budget to administer the contractual provisions and facilitate the development of effective customer programs for FY 1987 remains at $3 million (including $1.6 million of new budget authority). Western's customer C&RE program is based upon a strategy of cost-effective energy conservation measures combined with the development of renewable energy resources where economically feasible.

Status of Water Conditions in Western's Marketing Area

Based on the February 1986 "Water Supply Outlook for the Western United States" published by the Departments of Agriculture and Commerce, major river basins in the Western United States should produce below-normal to slightly above-normal flows this spring. The above-normal February precipitation should substantially increase this outlook.

The current 1986 supply outlook is for above-normal runoff in California in the Sacramento, San Joaquin, and North Coastal (i.e., Trinity) River Basins. Although precipitation since October was below normal, recent storms have increased reservoir storage and runoff projections. The projected water conditions should result in above-normal energy output from the CVP hydropower facilities.

The Missouri River Basin can generally expect slightly below-normal inflows and normal releases during water year 1986. The North and South Platte River Basins are forecast to have above-normal runoff. The Yellowstone River Basin is forecast to have near normal runoff. The combined annual runoff for the Missouri River Basin is expected to be near the long-term normal runoff. Current mainstem Missouri River storage remains about 5 million acre-feet below the desirable carryover storage target at this time of the year.

The water supply outlook for the Colorado River Basin is for above-normal runoff for the fourth consecutive year. Reservoir storage remains high. The April to July inflow forecast for Lake Powell, made early in February, was 9.5 million acre-feet or 127 percent of the 20-year average inflow. Subsequent February precipitation was above normal and, as a result, Colorado River Storage Project revenues again should sufficiently exceed expenses to allow substantial returns to the U.S. Treasury to repay investments.

PURCHASE POWER AND WHEELING

The total FY 1987 purchase power and wheeling program request is $113.7 million, including $76.7 million of new budget authority and application of prior balances of $37 million. In addition, Western has other financing amounting to $91.2 million from net billing, bill crediting, and nonappropriation transfers. This request provides for the purchase and wheeling of power to meet existing contractual commitments and for Western's participation in the Fuel Displacement Activity.

The increase of $41.2 million in the total program request is primarily due to Western's purchase of additional power from Basin Electric Power Cooperative (Basin) in FY 1987 to help meet CVP power delivery obligations. This will be the first full year of implementing the contract between Western and Basin for delivery of 185 MW of power. Western will reduce purchases from the Bonneville Power Administration (BPA) in FY 1987 due to transmission limitations and BPA policy with regard to Northwest power sales. This will decrease nonappropriation transfers with BPA that have offset appropriation requirements in the past.

Bill Crediting

Western is implementing a bill crediting process that reduces the amount of appropriated funds needed to meet the CVP purchase power and wheeling requirements. Under contracts negotiated with several major CVP customers, Western will determine each month the amounts those customers will pay directly to Western's power suppliers. In return, Western will credit the customers' CVP power bills in an amount equal to the customers' payment to the suppliers. The amount which can be bill credited is limited to the amount of revenue which Western would otherwise receive from those customers and by the amount of the bills received from Western's power suppliers.

When the FY 1987 budget was prepared, we assumed bill crediting of $33 million in FY 1986 and $36 million in FY 1987. However, higher levels of bill crediting may be achievable, possibly as high as $50-60 million a year. Although annual appropriation requirements are reduced under this process, a corresponding portion of customer receipts that would normally flow to the U.S. Treasury as payment to the Government will be foregone since the customer will assume the Government's obligation to pay the supplier for a portion of the power sold.

POWER RATES, REVENUES, AND REPAYMENT

Status of Project Power Rate Increases

In order to maintain sound financial footing, Western, since its establishment in 1977, has implemented 14 rate adjustments which are subject to FERC review. Rate adjustment activity was recently initiated for the Collbran Project and the Colorado River Storage Project (transmission rate).

Based on preliminary study analysis, rate adjustments are expected to be initiated in the near future for the Colorado River Storage Project, the Fryingpan-Arkansas Project, the Rio Grande Project, the AC portion of the Pacific Northwest-Pacific Southwest Intertie Project in Arizona and Nevada, and the Washoe Project (Stampede Powerplant).

Rates for the Boulder Canyon, Central Arizona-Navajo, and Falcon-Amistad Projects are adjusted either annually or monthly in accordance with repayment formulas set by contract or regulations.

Power Revenue and Energy Sales

During FY 1985, Western marketed 47.6 billion kWh of available energy to wholesale power customers and received electric service revenues of $613.6 million. Our estimate for FY 1986 energy sales and revenues is 37.0 billion kWh and $571.9 million, respectively. For FY 1987, energy sales are estimated at 35.4 billion kWh and revenues are estimated at $589.2 million.

The change in energy sales from FY 1985 through FY 1987 is due to above-normal runoff in the Colorado River Basin in

FY 1985, which resulted in greater nonfirm energy for sale in FY 1985 than initially projected. The FY 1986 estimated energy sales are based on normal river basin runoffs for the year.

Power Repayment

As of September 30, 1985, the investment to be repaid by Western's power system revenues totaled approximately $4.1 billion, of which $2.3 billion remains to be repaid. Cumulative power receipts total $6.3 billion and have been applied as follows: $2.2 billion for operation and maintenance and other expenses; $1.0 billion for purchase power and wheeling; $1.3 billion for interest; and $1.8 billion for repayment of investment in facilities and assistance to irrigation.

The following table summarizes Western's repayment status by project:

STATUS OF REPAYMENT AS OF SEPTEMBER 30, 1985[1/]
(DOLLARS IN MILLIONS)

Project	Power [2/] Investment	Power Receipts	Operating Expenses (O&M) and Other	Purchase Power	Interest	Repayment To Date	Unpaid Investment
Boulder Canyon	$ 177	$ 567	$ 291	$ 0	$ 150	$ 126	$ 51
Central Valley	691	1,339	287	679	159	214	477
Collbran	16	11	4	0	6	1	15
Colorado River Basin (Navajo)	244	573	440	0	53	80	164
Colorado River Storage [3/]	862	1,136	259	241	232	404	458
Falcon-Amistad	44	24	7	0	11	6	38
Fryingpan-Arkansas	179	2	0	0	2	0	179
Parker-Davis	173	395	147	12	67	169	4
Pick-Sloan	1,675	2,175	769	97	549	760	915
Pacific Northwest-Pacific Southwest Intertie [4/]	74	24	15	0	9	0	74
Rio Grande	13	36	19	5	12	0 [5/]	13
WESTERN TOTAL	$ 4,148	$ 6,282	$ 2,238	$ 1,034	$ 1,250	$ 1,760	$ 2,388

[1/] Cumulative data on an accrual basis of accounting and on the best information available at the time.

[2/] Power investment to be repaid includes irrigation-assistance investment.

[3/] Includes the Provo River Project.

[4/] AC facilities only.

[5/] Repaid to date is $242,000, which was rounded to zero.

Modified Repayment Practices

It is proposed that all PMAs will be defederalized, with the PMAs being transferred from Federal control by FY 1991. In the interim, the Administration proposed in FY 1987 to modify PMA capital investment repayment practices legislatively. These modifications require repayment of the unpaid balance of the original Federal investment at a level not less than would be required under a fixed, straight-line amortization schedule for each power investment financed by appropriations and placed in service. This requirement would not apply to irrigation investments. Repayments of principal, if necessary, can be deferred, subject to the same terms and conditions applicable to deferred interest payments (e.g., current interest rates are used because the deferral helps finance current operations). The impact of this repayment proposal is relatively modest compared to the proposal made in the budget request for FY 1986.

The following table is Western's current estimate of the increased revenue that will be generated in FY 1987-1991 as a result of the modified repayment practices.

IMPACTS OF MODIFIED REPAYMENT PRACTICES
(DOLLARS IN THOUSANDS)

	FY 1987	FY 1988	FY 1989	FY 1990	FY 1991
Estimated revenues using existing method	$589,174	$584,824	$579,499	$559,029	$542,444
Estimated increase attributable to modifications					
Principal	8,109	10,717	12,966	19,497	21,842
Interest	-10,734	17,791	15,620	19,661	12,628
Principal plus interest	- 2,625	28,508	28,586	39,158	34,470
Estimated total revenues after modifications	$586,549	$613,332	$608,085	$598,187	$576,914

Defederalization

Although funds are included in the budget for operating Western in FY 1987, the Administration will actively seek to defederalize our utility system.

The Administration will pursue defederalization through an open and competitive process involving the Congress and interested groups. It will be guided by the following principles:

(1) seek a fair return to the Federal taxpayers from the defederalization of our assets; (2) recognize the benefits currently enjoyed by existing customers; (3) recognize and provide appropriate protections for the personnel benefits of Federal employees; and (4) encourage efficient use of the Western Area Power systems.

Before implementation of defederalization, the Administration will seek the views of, and promote interest among, concerned groups and individuals, including congressional delegations, State and local officials, current customers, the financial community, and public power and private sector energy interests.

This concludes my statement of Western's FY 1987 budget request and program status. I would be pleased to respond to any questions you may have.

MANITOBA HYDRO PROJECT

Chairman HATFIELD. Would you comment on the Manitoba hydroelectric project as to WAPA's involvement? My concern is our involvement in importing power when there are power surpluses throughout the West, particularly the Northwest region. Could you explain a little bit why we are involved, how much we are involved, and so forth?

Mr. CLAGETT. I would be pleased to.

We are talking to Manitoba about 1,100 or 1,200 megawatts that might be imported into North Dakota some time after 1995. The expectation is that this would be after the surpluses are depleted. In that project, it is a long way from the Nelson River to the United States, so we are talking about $700 million worth of transmission construction cost, of which about one-third would be in the United States. The line is a considerable distance from the Northwest, so there would be minimal, if any, impact in the Northwest.

Chairman HATFIELD. With Federal involvement, obviously, financial involvement? There is no other way that those transmission lines would be constructed?

Mr. CLAGETT. Senator, I hesitate to say, because I really don't know. The next step that we have to look at is the financing of the transmission line. We are representing various utilities in the United States that are actually making the purchase. Manitoba requested that there be only one entity to represent the U.S. interest. We are the one entity that encompasses that area. There already is hydro there and, therefore, we understand it.

There was no other utility with sufficient resources to bring the effort together.

ADDITIONAL PREPARED QUESTIONS FOR THE RECORD

Chairman HATFIELD. I will submit some additional questions for your response.

[The questions and answers follow:]

QUESTIONS SUBMITTED BY CHAIRMAN HATFIELD

FY 1987 Program Initiatives

Question: What new programs or initiatives are proposed in the 1987 budget which were not funded in 1986?

Answer: Western has no major new programs or initiatives proposed in FY 1987. However, Western will award construction contracts to continue to upgrade and rehabilitate the power systems. I would like to provide a list of facilities planned for construction contract awards in FY 1987.

(The information follows:)

Transmission Lines and Terminal Facilities:

Casper-Dave Johnston 230-kV Transmission Line (Wyoming)
Conrad-Shelby 230-kV Transmission Line (Montana)
Casper-Waltman 115-kV Transmission Line (Wyoming)
Liberty-Parker 230-kV Transmission Line (Arizona)
Curecanti-Montrose 115-kV Transmission Line (Colorado)

Substations and Buildings:

Dawson County Substation Additions (Montana)
Morris Substation Additions (Minnesota)
Sioux City Substation Additions (Iowa)
Cheyenne Substation Additions (Wyoming)
Bismarck Substation Additions (North Dakota)
Gering Service Center Additions (Nebraska)
Flandreau Substation Additions (South Dakota)
Casper Service Center Additions (Wyoming)
Wolf Point Substation Additions (Montana)
Power Marketing Operations Complex Warehouse Yard Paving (Colorado)

Question: How would the proposed change in your repayment process effect your power rates?

Answer: I will provide a table for the record showing the effects of modified repayment reform on Western's power rates.

(The table follows:)

WESTERN AREA POWER ADMINISTRATION
PRESENT AND PROJECTED POWER RATES
(in mills/kWh unless otherwise indicated)

Project	Present Method Composite Rate (As of Sept. 30) FY85 Actual	Present Method Composite Rate (As of Sept. 30) FY87 Est.	Modified Repayment Practices - Composite Rate As of Sept. 30, FY87 Est.	Change from Present Method
Boulder Canyon 1/2/3/	5.74	11.96	11.96	0.00
Central Valley	27.18	39.63 4/	34.74	-4.89
Collbran	19.3	22.5 5/	27.90 5/	5.40 5/
Colorado River Basin (Navajo) 1/	19.36	22.19	6/	
Colorado River Storage	9.92	9.92	9.92 7/	0.00 7/
Falcon-Amistad 1/	15.77	13.06	6/	
Fryingpan-Arkansas	$37.32/kW/year	$46.65/kW/year 5/	$60.83/kW/year 5/	$14.18/kW/year 5/
Pacific Northwest-Pacific Southwest Intertie (Transmission)	$4.46/kW/year	$7.56/kW/year	$26.79/kW/year	$19.23/kW/year
Parker-davis	8.55	8.55	10.28	1.73
Pick-Sloan Missouri Basin Program	7.44	7.44	7.44 7/	0.00 7/
Rio Grande	30.85	38.0 5/	18.87 5/	-19.13 5/

NOTE: The data presented in this tabulation is based on recent information not available for earlier budget responses.

1/ Computed periodically by formula. Effective rate as determined by dividing revenue by sales.

2/ Operating year (12 months ending May 31).
3/ Firm energy rate plus the generating charge (capacity).
4/ Study based rate approved by FERC to take effect on October 1, 1986.
5/ Assumes that the project integration is not in effect and that the FY 1986 Present Method rates will also be those for FY 1987. Impact will be diffused when these projects are integrated, as currently planned.
6/ These Projects are not impacted. For the Colorado River Basin Project (Navajo) the investment is for irrigation only. For the Falcon-Amistad Project, contractual restrictions govern repayment.
7/ These projects are repaying principal at a faster rate than would be required under straight line amortization, although repayment schedules may have to be adjusted for some features of the projects. Under the repayment proposal, some features may be repaid faster than currently planned, while other features may be repaid slower.

California-Oregon Transmission Project

Question: Please update the Committee on the status of negotiations and progress related to the California-Oregon Transmission Project.

Answer: The plan for constructing a new 500-kV transmission line from southern Oregon to California as described in the Memorandum of Understanding is moving forward. Two recent significant events are the completion of the Project Development Agreement and the allocation of the 3.125 percent of the Project transfer capability that was set aside by the Secretary of Energy in his Memorandum of Decision dated February 7, 1985.

The Project Development Agreement, which provides for up to $27 million for Project development work retroactive to September 30, 1985, went into effect when the last signature was obtained on February 26, 1986. This development work will take the Project to the decision point of whether or not to proceed with construction and covers such items as project management, environmental studies, technical studies, design, and specification preparation.

A good start on the environmental and power system studies work has already been made under the interim funding arrangements. A preliminary plan has been developed and a draft Environmental Impact Statement is expected to be published by November 1986. The projected inservice date of the Project is early 1991. The total estimated cost is $430 million (1991 price levels) excluding system additions or modifications in the Pacific Northwest.

One of the conditions the Secretary placed on his acceptance of the MOU was to set aside 3.125 percent of the Project transfer capability. This set-aside was to be allocated by Western among non-Federal public entities who were not participants in the original MOU. Western conducted public proceedings and completed allocations to all eligible applicants on October 22, 1985.

Question: Are negotiations proceeding in a satisfactory way?

Answer: Negotiations have been completed between the original participants and the allottees to bring the allottees into the Project. The document used to achieve this is an agreement called the MOU Annex. The MOU Annex modifies the MOU and the Project Development Agreement to recognize the allottees as additional participants. As of February 22, 1986, all six allottees had signed the MOU Annex and paid their share of Project expenses incurred to date. All participants are expected to sign the MOU Annex in the very near future. There have been a few problems to overcome from time to time in the various negotiations, as one might expect with each of the

18 participants involved having different interests and needs. However, these problems have eventually been worked out and the project has continued to move ahead.

Question: Do you foresee any problems ahead?

Answer: With continued cooperation of the participants, the only major problem that I foresee at this time is the possibility that if one or more of the participants with significant project shares is unable to proceed with construction due to insufficient economic justification, then it could become very difficult for the remaining participants to proceed with the Project.

Question: What were the results of the transmission tower test WAPA has conducted?

Answer: Western removed an existing tower from service, modified it in accordance with designs and subjected it to loadings expected on the new line. In December 1985, the modified tower passed all tests confirming Western's expectation that the existing CVP double circuit 230-kV towers could be economically converted to single circuit 500-kV towers in the 200-mile uprate section of the 330-mile project.

Question: Your statement mentions the need for additional Project facilities and the potential for delays in the Project. What are your views on this change?

Answer: The additional facilities I mentioned in my statement are not needed to integrate the project into the transmission grid, but Pacific Gas and Electric Company has determined that they are needed so that PG&E can fulfill their wheeling obligations as described in the Project Memorandum of Understanding. PG&E has indicated that approximately 85 miles of new 500-kV line would be required between the Los Banos and Gates substations in Merced and Fresno Counties in California.

Question: What are the potential impacts on the Project?

Answer: Expansion of the environmental studies to address these facilities will likely delay completion of the environmental work by about 5 months. However, this is not expected to delay the inservice date of the Project, since the critical path item in the Project schedule at this point is the California Public Utility Commission certification process for participation by Investor-Owned Utilities.

Manitoba Hydro Project

Question: Discuss WAPA's involvement in the proposal for possible long-term power supply from a proposed hydroelectric powerplant in Manitoba. How much has WAPA spent on this effort to date?

Answer: Western has been involved in discussions and negotiations with the Provincial Government of Manitoba for a possible long-term power supply arrangement from a proposed Canadian hydroelectric powerplant on the Nelson River. Based on our customers' requests and letters of interest in such an arrangement, Western and Manitoba have signed a letter of intent which outlines the basic sales principles. These principles state that Manitoba will build and sell the entire output of the proposed hydroelectric powerplant for 35 years at a negotiated percentage of the average cost of the next two coal-fired thermal powerplants to be built in the Missouri River area. The proposed powerplant in Manitoba is scheduled to be placed in service between 1995 and 1998. Before the final contractual arrangements can be executed, Manitoba and Western's customers must agree upon the detailed costs and purchase percentage of the proposed thermal alternative. Conceptual studies to identify the costs and needed transmission facilities south of the Canadian border have already been completed. Since general planning activities began several years ago, Western has expended about 5 work years of effort on this project amounting to approximately $225,000.

Question: How will the power be transmitted to WAPA's system?

Answer: The power would be transmitted from the powerplant site on the Nelson River in northern Manitoba to Winnepeg, Manitoba, by means of a ±500-kV direct-current transmission system. From Winnepeg, power would be transmitted across the international border to a point of interconnection on WAPA's system by either a ±500-kV direct-current or a 500-kV alternating-current transmission line. From this point of interconnection, approximately 180 miles of new 345-kV line would be required to integrate the project with WAPA's transmission system. Manitoba would construct the facilities in Canada, and the United States participants would construct the facilities in the United States.

Question: What is the potential Federal financial commitment?

Answer: WAPA has not committed any Federal funding to the proposed Manitoba purchase. The agreed sale principles indicate that the hydropower, transmission, and related facilities within Manitoba would be owned, financed, and constructed by Manitoba. The participating utilities in the United States would be responsible for the power costs and transmission costs in the United States. The cost of transmission facilities located in the United States is estimated at between $250 and $330 million. Whether the Federal Government would finance and own all or a portion of the United States transmission facilities has not been determined. However, if Federal financing is required, funds would not be required for some years since the probable date of first commercial operation of the project is about 1998.

Question: Could the necessary transmission and related facilities be constructed without Federal/WAPA involvement?

Answer: While it would be possible for another entity to construct the project transmission line between the Canadian border and the point of interconnection with the WAPA system, it would still be necessary to use the WAPA system to transmit power to many of the project participants. WAPA's expertise in transmission planning, design, construction, and operation would make WAPA a logical candidate for managing this effort. Also, there may be opportunities for additional power exchanges between WAPA and Manitoba Hydro based on hydraulic and load diversity.

Question: Specifically, who are the customers that have requested Western to negotiate with Manitoba?

Answer: On August 22, 1985, Western held a public information meeting in Sioux Falls, South Dakota, to inform customers about the current status and new developments of the Manitoba sales proposal. During the meeting, Western specifically requested customers to provide written statements as to whether or not they were still interested in the Manitoba sales proposal.

Fifteen customers provided written comments. Thirteen of the fifteen customers have expressed interest in the Manitoba Hydro resources. The total requested power is in the range of 800 to 1150 MW. A list of customers will be supplied for the record.

(The information follows:)

Potential Customers

1. Basin Electric Power Cooperative, Bismarck, North Dakota
2. City of Moorhead, Moorhead, Minnesota
3. Cooperative Power, Eden Prairie, Minnesota
4. Fremont, Department of Utilities, Fremont, Nebraska
5. Heartland Consumers Power District, Madison, South Dakota
6. Lincoln Electric System, Lincoln, Nebraska
7. Missouri Basin Municipal Power Agency, Sioux Falls, South Dakota
8. Nebraska Municipal Power Pool/Municipal Energy Agency of Nebraska, Lincoln, Nebraska
9. Nebraska Public Power District, Columbus, Nebraska
10. Northwestern Public Service Company, Huron, South Dakota
11. Omaha Public Power District, Omaha, Nebraska
12. Willmar Municipal Utilities, Willmar, Minnesota
13. Wyoming Municipal Agency, Lusk, Wyoming

Question: Why is this proposal being advanced given the power surpluses that exist in most of the West, including the Pacific Northwest region?

Answer: Since the cost of the power purchased from Manitoba will be based on a percentage of the cost of alternate thermal power plants proposed for future construction in the Upper Missouri River drainage area, the sale of power from Manitoba will be restricted to WAPA's customers in the Missouri River Basin drainage area, which includes the States of Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, and Wyoming. Load/resource projections for the Mid-Continent Area Power Pool area indicate that there will be a need for significant generation additions or imports in the 1998-1999 time period. The proposed purchase from Manitoba could be utilized to satisfy a portion of that need with comparatively little transmission construction. Power transfers from the Western United States would require considerably more transmission construction in the United States. Additionally, it is likely that the surpluses of economical, base-load capacity that now exist in the West would largely be committed to load by the 1998-1999 time frame with only existing high-cost gas- or oil-fired generation remaining in surplus.

Question: Can the power needs, envisioned by the Manitoba project, be met by domestic sources?

Answer: Future electrical load growth in the project area could be met through the construction of conventional coal-fired or nuclear powerplants in the MAPP area. However, since the cost of the power purchase from Manitoba is to be tied to a negotiated percentage of these alternate costs, the Manitoba purchase, if consummated, would have to be a more economical and environmentally compatible source of power than these other alternatives.

Kansas Transmission Study

Question: Bring the Committee up to date on the Kansas Transmission Study.

Answer: In 1983, the Western Area Power Administration proposed Pick-Sloan Missouri Basin Program Post-1989 Marketing Plan included portions of Kansas in the marketing area. Western does not presently have any electrical facilities in Kansas, nor does it presently serve any customer load in Kansas.

In 1984, Western was approached by the Kansas congressional delegation to examine alternatives for the delivery of Federal power to load centers in Kansas, at the most economic cost. In January 1985, Western and the Southwestern Power Administration initiated a Kansas Transmission Study to determine transmission system modifications to accommodate Federal power deliveries and possible exchanges between the power marketing administrations, and at the same time, requested interested utilities to identify their projected transmission needs in the Kansas, Missouri, Oklahoma, and Nebraska areas. Fifteen different entities chose to participate. Western recently completed the study. The results of the study indicate that the existing transmission system can accommodate these needs if some minor modifications are made in western Kansas.

An economic analysis was then conducted to determine the costs and benefits associated with the two projects. Western briefed the Kansas Corporation Commission on March 5, 1986, to inform them of the results of the economic analysis. Western will make a presentation to the Kansas congressional delegation in April 1986.

Question: Is this something that is needed from an operational standpoint?

Answer: No, it is not something that is necessary to operate Western's current system. However, it is necessary to accommodate delivery of power into Kansas. Benefits to the delivery of preference power into Kansas include reduced costs to proposed Kansas allottees due to the delivery of Federal power, deferred fossil fuel plant construction and reduced oil use as result of the PMA exchanges, and improved operational flexibility and system reliability as a result of the improved and interconnected transmission systems.

Question: What is the estimated cost to the Federal Government of this proposal?

Answer: The annual transmission cost of delivering preference power into Kansas would range from $3.0 to $7.1 million per year depending on the method of acquisition. The Post-1989 Pick-Sloan Missouri Basin Program Marketing Plan provides several options for acquiring transmission beyond the existing Pick-Sloan system. The options range from the customer paying all costs to Western constructing additional facilities.

Annual transmission and purchased capacity costs associated with the Western/Southwestern resource exchanges that were determined to be economically justifiable would range from $5.3 to $11.7 million per year depending on the method of acquiring a transmission path.

By simultaneously providing for delivery of preference power and PMA exchanges the annual cost savings would be $1.5 to $2 million per year over implementing the programs independently.

The method of financing has not been determined. However, the cost is expected to be borne by the rate payers. Therefore, any funding by the Federal Government would ultimately be repaid by the rate payers.

Question: What additional facilities would be needed to provide this service?

Answer: Several capacitor banks must be added and approximately 80 miles of 115-kV transmission line must be reconductored in western Kansas in order to accommodate both the delivery of power to preference customers in Kansas and the integration of resources between Western and Southwestern Power Administrations. The total annual cost of improvements is estimated to be $0.4 million per year.

Mead-Northwest DC Intertie

Question: How much is included in the 1987 budget request for activities related to the Mead-Northwest DC Intertie?

Answer: Western has included $769,000 in its FY 1987 budget request for planning studies for the Mead-Northwest DC Intertie.

Construction and Rehabilitation

Question: Your statement indicates that of the $84 million requested for Construction and Rehabilitation, $41.1 million, almost 50 percent, is to begin new transmission line additions, substation additions, and service center additions. Why, given tight budget times, is such a large portion of your funding request for initiation of new facilities?

Answer: The Conrad-Shelby 230-kV transmission line is the only significant new facility included in the funding request. Most of the work proposed involves upgrading or rehabilitating existing facilities. Without these facility improvements, Western would not be able to ensure the power system's continued reliability. To ensure reliable operation of its transmission system, Western must rehabilitate, upgrade, or replace transmission facilities which have reached the end of their useful service, have became overloaded, or have sustained damage.

Question: What adverse operational problems are currently being experienced?

Answer: Some of the adverse operational conditions now being experienced are: limited transmission capacity and deteriorated condition of lines in Arizona, Colorado, Montana, and Wyoming; high energy and power losses and reduced reliability in the Cutbank/Shelby area of Montana; reduced reliability and stability in the Colorado River-Phoenix area; reduced reliability because of deteriorated transmission structures and transmission line susceptibility to lightning strikes; reduced reliability due to increasing loads and aging equipment in the Morris, Dawson County, and Sioux City Substations.

Question: What is the total estimated cost of the 15 new projects being initiated in the 1987 budget?

Answer: The total estimated cost is approximately $61 million which includes $10.7 million for the new Conrad-Shelby 230-kV transmission line and approximately $50.3 million for upgrade and rehabilitation of existing facilities.

Question: Please provide for the record a table listing each of these projects in priority order including the total estimated cost and budget request for each.

Answer: I will provide a listing in priority order of the 15 facilities.

(The information follows:)

FY 1987 Facilities

Transmission Lines & Terminal Facilities	Total Estimated Cost	FY 1987
	(In thousands of dollars)	
Casper-Dave Johnston 230-kV T.L. (Wyoming)	8,979	7,230
Conrad-Shelby 230-kV T.L. (Montana)	10,675	8,550
Casper-Waltman 115-kV T.L. (Wyoming)	6,954	5,555
Liberty-Parker 230-kV T.L. (Arizona)	14,700	6,775
Curecanti-Montrose 115-kV T.L. (Colorado)	3,700	2,112
Subtotal	45,008	30,222
Substations and Buildings:		
Dawson County Substation Additions (Montana)	1,600	1,460
Morris Substation Additions (Minnesota)	1,610	1,430
Sioux City Substation Additions (Iowa)	1,640	1,490
Cheyenne Substation Additions (Wyoming)	2,087	1,240
Bismarck Substation (North Dakota)	398	348
Gering Service Center (Nebraska)	744	638
Flandreau Substation (South Dakota)	2,645	2,450
Casper Service Center (Wyoming)	550	335
Wolf Point Substation Additions (Montana)	4,240	1,180
Power Marketing Operations Complex Warehouse Yard Paving (Colorado)	482	427
Subtotal	15,996	10,998
Total	61,004	41,220

Question: What was the WAPA request to OMB for new contract awards?

Answer: Western's budget request to the Office of Management and Budget for contract awards was approximately $40 million. This amount is essentially equivalent to our congressional budget request.

Purchase Power and Wheeling

Question: By far the largest single increase in funding is in the request for Purchase Power and Wheeling. The appropriations request is increasing from $46.7 million in 1986 to $76.7 million in 1987. What accounts for this large increase?

Answer: The increase in the FY 1987 purchase power and wheeling program is primarily due to Western's purchase of power from Basin Electric Power Cooperative to help meet Central Valley Project power delivery obligations. This will be the first full year of implementing the contract between Western and Basin for delivery of 185 MW of power. Western will reduce purchases from the Bonneville Power Administration in FY 1987 due to the commitment to purchase Basin Electric Power. This will decrease nonappropriation transfers with BPA, which have offset appropriations in the past. We have also experienced significant increases in capacity charges from Pacific Gas and Electric Company.

Question: Is there any way to limit these large changes from year to year?

Answer: Western's purchase power and wheeling activity is constantly changing which makes it difficult to project with a high degree of accuracy what funding requirements will be from one year to the next. Some of the factors that make it difficult to project the PP&W budget are: variations in the prices and amounts of surplus available from the Pacific Northwest; variations in the California thermal power sources Western uses to support the CVP; and the amount of net billing, bill crediting and nonappropriated transfers available to support the PP&W program.

Western is continually looking for methods to increase the degree of certainty in its appropriations requirements. Western considers the implementation of a revolving fund where revenue would be available without further appropriation to pay for the purchase and wheeling of power to be the best method of eliminating the impact of the PP&W activity on the appropriations process.

Question: The budget justification indicates that WAPA will be reducing power purchases from BPA in 1987. Can you explain the reasons for this action?

Answer: WAPA and BPA had a surplus firm power sales agreement that terminated in February 1986 after the Basin Electric purchases commenced. This reduction in firm surplus purchases from BPA is reflected in WAPA's budget projections. In lieu of firm power purchases from BPA, Western expects to purchase surplus, nonfirm energy from both BPA and other Northwest entities.

Question: What is the value of the power WAPA will no longer purchase from BPA?

Answer: The cost of firm surplus power that had been purchased from BPA was approximately $2 million per month delivered in California.

Buy America

Question: Section 506 of P.L. 99-141 provides that agencies shall determine the incremental costs associated with implementing the "Buy American" requirement and defer or offset such incremental costs against otherwise existing repayment obligations. Does the Western Area Power Administration anticipate purchasing the type of high power EHV equipment defined by committee report #99-195? If so, what is the total cost of the equipment purchase?

Answer: Yes, Western anticipates purchasing various types of EHV equipment. A tabulation showing planned EHV equipment by type of equipment for fiscal years 1986 and 1987 is provided for the record.

(The information follows:)

EHV Equipment

(In thousands of dollars)

Type of Equipment	FY 1986	FY 1987
Transformers	10,000	0
Series Capacitor Banks	0	2,500
Power Circuit Breakers	0	1,000
Relays	0	40
Tapered Tubular Steel Structures or Structural Units	6,400	7,400
Total	16,400	10,940

Question: How will the Power Administration absorb the increased costs? Will you pass the costs through to the consumer or the taxpayer? Have you estimated the average additional cost to the ratepayer and/or the revenue impact?

Answer: Western has not purchased any extra high voltage equipment thus far in FY 1986; however, for evaluation of bids, a 25 percent differential will be added to bids received from foreign manufacturers. Western's customers will not bear the incremental costs as they will be deferred or offset against existing repayment obligations. Estimates of additional costs and revenue impacts are not available since we have not yet gone through the procurement process for these equipment purchases.

Question: Do you think that this type of "Buy American" provision could have a harmful impact on our relations with those trading partners with whom we enjoy a very favorable balance of trade? Do you believe that an appropriations measure is the appropriate vehicle to deal with a complex trade issue that could have significant trade policy consequences?

Answer: Western is sympathetic to the pressures faced by domestic EHV vendors when they are confronted by competition from foreign vendors whose prices may have been made especially attractive by the relative strength of the dollar against other currencies in the last several years. The Administration objected to this statutory approach because history has shown that the passage of such legislation would do more harm than good to the American economy. This is still the Administration's position.

Procurement Restrictions

Question: As you know, the fiscal 1986 appropriations act contains a 25 percent price preference on procurement of EHV equipment which is manufactured in the U.S. Assuming these restrictions apply, please list each fiscal 1986 procurement for your agency that has been, or will be, affected by the restriction, and the amount of each procurement. Explain the impact of the restriction on the procurement using both the definition of EHV equipment contained in the Statement of Managers accompanying the Conference Report on H.R. 2959 and the definition contained in the statement on the floor of the Senate during consideration of the Conference Report on H.R. 2959.

Answer: To date, Western has not procured any extra high voltage equipment in FY 1986. Impacts of the EHV provision can only be determined after the future procurements have been completed. A list will be provided showing our planned procurements using both definitions of EHV equipment.

(The information follows:)

PROJECTED EHV EQUIPMENT PURCHASES FOLLOWING STATEMENT ON FLOOR OF SENATE ON H.R. 2959

(In thousands of dollars)

Type of Equipment	FY 1986
Transformers	10,000 1/
Total	10,000

PROJECTED EQUIPMENT PURCHASES FOLLOWING MANAGERS STATEMENT, CONFERENCE REPORT ON H.R. 2959

(In thousands of dollars)

Type of Equipment	FY 1986
Transformers	10,000 1/
Series Capacitor Banks	0
Power Circuit Breakers	0
Relays	0
Tapered Tabular Steel Structures Structural Units	6,400 2/
Total	16,400

1/ Majority associated with purchase of phase shifting transformers.

2/ New transmission line contract awards scheduled in 4th quarter.

Question: If the same restriction were continued in fiscal 1987, please list each anticipated procurement by your agency that would be affected, estimate the amount of each procurement, and explain the impact of the restriction on the procurement. Provide the same type of information for the period 1988-1992, assuming the restriction were continued for your agency. Again, answer the questions separately for each definition of EHV equipment.

Answer: Tables showing Western's projected EHV procurements for FY 1987 and the period 1988-1992 will be provided for the record. Since Western has not yet procured any equipment which falls under the EHV provision, the impacts cannot yet be evaluated.

(The information follows):

TABLE 1

PROJECTED EHV EQUIPMENT PURCHASES FOLLOWING
STATEMENT ON FLOOR OF SENATE, ON H.R. 2959
(In thousands of dollars)

Type of Equipment	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990	FY 1991	FY 1992
Transformers	10,000	0	18,200**	0	*	*	*
Shunt Reactors	0	0	4,400**	0	*	*	*
Power Circuit Breakers	0	1,000	4,800	750	*	*	*
Totals	10,000	1,000	37,400	750			

TABLE 2

PROJECTED EHV EQUIPMENT PURCHASES FOLLOWING
MANAGERS STATEMENT, CONFERENCE REPORT ON H.R. 2959
(In thousands of dollars)

Type of Equipment	FY 1986	FY 1987	FY 1988	FY 1989	FY 1990	FY 1991	FY 1992
Transformers	10,000	0	18,200**	0	*	*	*
Series Capacitor Banks	0	2,500	16,500**	0	*	*	*
Power Circuit Breakers	0	1,000	4,800**	750	*	*	*
Relays	0	40	80	650**	*	*	*
Tapered Tabular Steel Structures or Structural Units	6,400	7,400	5,500	4,800	*	*	*
Total	16,400	10,940	45,080	6,200			

* Planning projections are not available for these outyears since engineering details are not final.

** Most of these amounts are associated with planned purchases for the California-Oregon Transmission project and would be upfront funded by participants.

Question: How much EHV procurement has your agency undertaken in the last five years (fiscal 1982-1986)? Please list each procurement that would have been affected by the restriction, identify the successful bidder, and specify the dollar amount of the contract awarded. Again, answer the questions separately for each definition of EHV equipment.

Answer: Review of our procurements from 1982 through 1985, to determine the impact of the 25 percent price preference to domestic manufacturers would have had on the procurements, revealed that one procurement action would have been effected out of eleven procurement actions. Under the Statement of Managers definition, eleven procurement actions would have been effected out of 50 procurement actions under the definition contained in Conference Report on H.R. 2959. It would, therefore, appear that there would be less of an impact on procurements under the Statement of Managers definition. Tables are provided listing the EHV equipment procurements. All the EHV equipment procured in the last five years will be listed; those for which the successful bidder would have been changed if the Buy American restrictions had been in effect will be marked by an asterisk. Table 1 lists the EHV equipment in accordance with the definition provided by the Senate in the October 26, 1986, Congressional Record; that is, equipment rated at and operating above 242-kilovolts and less than 1000-kilovolts. Table 2 lists EHV equipment as defined by the House Conference Report which accompanied H.R. 2959.

(The information follows:)

TABLE 1

Power Circuit Breakers and Power Transformers Rated 242-kV and Above

Contract Number	Equipment	Manufacturer	Contract Price (In dollars)
FY 1982			
82WP15680	Breakers	Merlin Gerin	618,328
FY 1983			
83WP15776	Transformer	McGraw Edison	700,905
83WP15781	Transformer	Federal Pacific	914,355
83WP15849-(#2)	Breakers	High Voltage Circuit Breakers, Inc.	342,121
83WP15849-(#3)	Breakers	High Voltage Circuit Breakers, Inc.	488,190
83WP15859*	Transformer	Ferranti Packard	981,825
FY 1984			
None			
FY1985			
85WP16008-(#1)	Breakers	Brown Bovari	341,740
85WP16008-(#2)	Breaker	Brown Bovari	174,520
85WP16013	Transformer	McGraw Edison	980,579
85WP16094	Breakers	Brown Bovari	579,390
85WP16135	Breakers	High Voltage Circuit Breakers, Inc.	837,396
FY 1986			
None yet			

TABLE 2

Power Circuit Breakers and Power Transformers, Relays and Other Equipment Defined as EHV per the Conference Report on H.R. 2959

Contract Number	Equipment	Manufacturer	Contract Price (In dollars)
FY 1982			
82WP15473	HVDC System	General Electric	28,371,668
82WP15647	Transformers	Federal Pacific	1,669,861
82WP15680	Breakers	Merlin Gerin	618,328
FY 1983			
83WP15701	Transformer	H.K. Porter	465,146
83WP15730	Transformer	H.K. Porter	247,952
83WP15773	Relays	General Electric	11,550
83WP15773-(#2)	Relays	General Electric	18,675
83WP15776	Transformer	McGraw Edison	1,577,836
83WP15781	Transformer	Federal Pacific	914,355
83WP15801*	Reactor	Trench	280,800
83WP15819	Transformer	McGraw Edison	2,681,512
83WP15849-(#2)	Breakers	High Voltage Ckt. Bkr. Inc.	342,121
83WP15849-(#3)	Breakers	High Voltage Ckt. Bkr. Inc.	488,190
83WP15852*	Relays	ASEA	287,100
83WP15859*	Transformer	Ferranti Packard	981,825
83WP15861	Transformers	Federal Pacific	1,478,600
FY 1984			
84WP15853*	HVDC System	Siemens-Allis	20,775,000
84WP15876	Transformers	H.K. Porter	731,902
84WP15893-(#1)	Relays	General Electric	137,700
84WP15893-(#2)*	Relays	ASEA	7,040
84WP15893-(#3)*	Relays	ASEA	12,830
84WP15921-(#1)	Transformer	Federal Pacific	340,450
84WP15921-(#2)	Transformer	Federal Pacific	419,780
84WP15992-(#14)	Relays	GEC of England	4,650
84WP15993*	Relays	GEC of England	11,400
84WP15993-(#5)	Relays	GEC of England	22,425
84WP15993-(#8)	Relays	GEC of England	7,000
84WP15004-(#4)	Relays	Brown Bovari	345,045
84WP15994-(#15)	Relays	Brown Bovari	12,500
84WP15994-(#18)	Relays	Brown Bovari	4,450
84W-15998-(#1)	Relays	General Electric	136,500
84WP15998-(#2)*	Relays	GEC of England	223,500
84WP15998-(#3)	Relays	GEC of England	56,400

Contract Number	Equipment	Manufacturer	Contract Price
FY 1985			
85WP16008-(#1)	Breakers	Brown Bovari	341,740
85WP16008-(#2)	Breakers	Brown Bovari	174,520
85WP16019-(#1)	Relays	GEC of England	108,000
85WP16019-(#2)	Relay	GEC of England	17,000
85WP16079-(#1)*	Transformer	O.E.L.	408,600
85WP16079-(#2)*	Transformer	O.E.L.	614,600
85WP16079-(#4)*	Transformer	O.E.L.	243,375
85WP16079-(#6)	Transformer	O.E.L.	181,000
85WP16079-(#7)	Transformer	O.E.L.	225,300
85WP16086	Transformer	H.K. Porter	755,690
85WP16094	Breakers	Brown Bovari	579,390
85WP16131	Transformer	McGraw Edison	980,579
85WP16135	Breakers	High Voltage Ckt. Bkr. Inc.	837,396
85WP16139*	Transformer	Moloney	348,745
85WP16142	Transformer	Federal Pacific	281,255
FY 1986			
85WP16132-(1&2a)	Relays	General Electric	175,500
86WP16132-(#3-5)	Relays	ASEA	11,814
85WP16132-(#7&8)	Relays	GEC of England	26,400
86WP16132-(#9)	Relays	GEC of England	31,374
85WP16132-(#10)	Relays	General Electric	1,136
86WP16132-(#11)	Relays	General Electric	5,540
86WP16193	Breaker	ASEA	115,180

TABLE 2a

Tubular Steel Poles

Contract Number	Equipment	Contractor	Contract Price (In dollars)
FY 1982			
82WP15554	Steel structures	Valmont	375,000
FY 1983			
83WP15762	Steel structures	C-E American	5,890,000
FY 1984			
84WP15873	Steel structures	Valmont	76,000
84WP15896	Steel structures	ITT Meyer Ind.	2,023,000
84WP15906	Steel structures	Hyundai	2,300,000
84WP15907	Steel structures	Valmont	680,000
84WP15938	Steel structures	Power Enterprises	389,000
FY 1985			
85WP16021	Steel structures	Anchor Metals	429,000
85WP16046	Steel structures	ITT Meyer Ind.	6,955,000
85WP16050	Steel structures	ITT Meyer Ind.	78,000

Question: Please identify the American manufacturers of EHV equipment. In your opinion, are there sufficient American EHV manufacturers to offer competitive bidding in EHV equipment procurement? Answer the questions separately for each definition of EHV equipment.

Answer: Based upon our bidding experience, we believe that Western has received competitive bid proposals from the American EHV manufacturers. I will provide a table showing American Manufacturers for each definition of EHV equipment. The table reflects Western's experience on EHV equipment up to 345-kV.

(The information follows:)

TABLE 3
American Manufacturers of EHV Equipment

I. Definition as contained in statement on the floor of the Senate, Conference Report on H.R. 2959.

Transformers
- General Electric Company
- Westinghouse Corporation
- McGraw Edison Company

Power Circuit Breakers

- Highvoltage Circuit Breakers Inc.
- Brown Bovari
- ASEA

Shunt Reactors

- General Electric Company
- Westinghouse Corporation
- McGraw Edison Company

II. Definition as contained in Statment of Managers, Conference Report on H.R. 2959.

Transformers
- General Electric Company
- Westinghouse Electric Corp.
- McGraw Edison Company
- Federal Pacific Electric
- Porter
- ASEA

Power Circuit Breaker
- High Voltage Circuit Breaker Inc.
- Brown Bovari
- ASEA

Series Capacitor Banks
- Westinghouse Electric Corp.
- General Electric Co.

Relays
- ASEA
- Westinghouse Electric Corp.
- General Electric Co.

Tapered Tubular Steel Structures or Structural Units
- Anchor Metals
- C-E American Pole
- Power Interprises
- ITT Meyer
- Valmont

BASIN ELECTRIC POWER COOPERATIVE

Chairman HATFIELD. The Senator from North Dakota?

Senator BURDICK. Mr. Clagett, what is the term of the contract between the Basin Electric Power Cooperative that sends considerable power to the California area? What is the duration of the contract?

Mr. CLAGETT. It is a 5-year contract, Senator.

Senator Burdick. Everything is in order now, I presume?

Mr. CLAGETT. Yes, sir; deliveries started in January.

Senator BURDICK. Thank you.

ADDITIONAL PREPARED QUESTIONS FOR THE RECORD

Chairman HATFIELD. Before we conclude, Senators Kasten and DeConcini have submitted some questions for the record.

Without objection, those questions will be included in the record at this point.

[The questions and answers follow:]

QUESTIONS SUBMITTED BY SENATOR KASTEN

EHV Equipment

Question: I would like to know how many U.S. companies are currently competitive in the extra high voltage (EHV) equipment market. It is my understanding that the current "Buy American" restriction on EHV equipment gives General Electric a monopoly on Federal EHV procurement. I would like your response to this situation.

Answer: I would like to insert a table for the record showing domestic EHV manufacturers.

(The information follows:)

Domestic EHV Manufacturers

EHV Equipment	Domestic Manufacturers
EHV Power Transformers	General Electric (GE) Westinghouse, McGraw Edison
EHV Power circuit Breakers	Up to 345-kV High Voltage Circuit Breakers, Inc., Brown Bovari, ASEA. No domestic manufacturers above 345-kV.
EHV Reactors	GE, Westinghouse, McGraw Edison
HVDC	GE

Question: One of the EHV manufacturers directly affected by last year's Buy American restriction is ASEA, a multinational company with significant operations in Wisconsin. I think it is important to point out for the record that the Buy American provisions will actually hurt about 1,000 Wisconsin workers. Have you had experience with ASEA's products? Are they competitive with those of other manufacturers in terms of price and quality?

Answer: Yes, ASEA has submitted proposals for PMA equipment procurements which have been consistently competitive in terms of price, quality and technology.

Question: How will the Buy American restrictions affect procurement by your agency? Will you have to pay more for EHV equipment? Are you likely to have fewer companies making bids?

Answer: It is too early to determine specific impacts of the Buy American restrictions. Section 506 of Public Law 99-141 provides a limited 1-year opportunity favorable to domestic manufacturers by increasing the bids of foreign manufacturers by up to 25 percent for bid evaluation purposes. We believe that increases the incentive for domestic manufacturers to bid during this one year period.

However, the Administration objected to this statutory approach because history has shown that the passage of such legislation would do more harm than good to the American economy. This is still the Administration's position. Recently Commerce Secretary Baldridge communicated this position in testimony before the Congress. Since this time last year, the price of the dollar has fallen 39 percent against the Japanese yen; 38 percent against the Swiss franc, and 22 percent against the Swedish krona.

The Administration is very encouraged by this development and is hopeful that this enhancement to the competitive position of the domestic EHV industry will obviate the need for continuation of the special one year consideration provided the domestic EHV industry in the FY 1986 Energy and Water Development Appropriation Act.

Question: If the Buy American provisions are continued another year, how much will it cost your agency (the U.S. taxpayer)? Can you project the costs if this provision were extended for another five years? Ten years?

Answer: We have not performed any detailed studies of the short or long range cost impacts of increasing the Buy American differential on future procurements. However, one simple calculation which indicates the possible impact is if you take the amended Buy American differential of 25 percent less the historic Buy American differential of 6 percent, this would equal a 19 percent cost impact.

QUESTIONS SUBMITTED BY SENATOR DECONCINI

Defederalization

Question: I am very concerned that the current move to privatize the Power Marketing Administrations would be a decision entered into in haste only to repent in leisure. To what extent do you have documentation and cold hard facts to support the contention that the American public and customers who now depend upon this power will be at least as well off as they are currently?

Answer: The Department has established initial task groups to study PMA defederalization. These groups will establish key policy issues including the structure of proposed sales, legislative issues, public process, protection of employee rights, regional economic concerns, and implementation management. The facts to support an equitable transaction will be developed in an open process designed to: seek a fair return to the Federal taxpayers from the defederalization of power marketing administration assets, recognize the benefits currently enjoyed by existing customers and other interests, recognize and provide appropriate protections for the personnel benefits of Federal employees, and promote efficient use of scarce and valuable energy resources.

Question: Do you have documentation or proof to show that specific savings would occur? What are those savings?

Answer: The savings associated with the defederalization of the power marketing administrations emanate from the efficiency gains associated with allowing the operating and resource allocation decisions of these commercial organizations to be disciplined more directly by the marketplace or by state or regional authorities that can better protect local interests. The Administration believes that the operating and resource decisions of these regional organizations should not be decided in the political context of the Federal budget process. It is, of course, difficult to place a precise estimate on the value of these benefits, however, we are confident that these efficiency gains will be achieved if we can accomplish the Federal divestiture of these assets.

Hoover Power Rates

Question: As you know one of the issues now before the Western Area Power Administration is to determine the new regulations governing the rates for Hoover power. Could you please tell me the status of that effort?

Answer: Subsequent to the enactment of the Hoover Power Plant Act of 1984, Western proceeded expeditiously to prepare and publish the necessary notices to ensure that the benefits to Western's customers would be assured while maintaining the continued revenue level necessary for the operation and repayment of the Boulder Canyon Project. Specifically, Western prepared and published in the Federal Register on May 17, 1985, proposed General Regulations for the Charges for the Sale of Power from the Boulder Canyon Project.

Western then held a public information forum on June 4, 1985, to explain the proposed regulations. This forum was followed by a public comment forum on July 1, 1985. At the public comment forum Western granted a 90-day delay in the proceedings in response to a request from the customers. The delay was to provide the customers an opportunity to resolve differences among themselves. During the 90-day delay, Western's staff met as requested, singularly and collectively, with the customers to answer their questions and provide data.

Subsequent to the delay, Western received customer's comments through October 1, 1985. After review of the comments, Western published revised proposed General Regulations in the Federal Register on November 29, 1985.

Western conducted another public comment forum on the revised proposed General Regulations on December 19, 1985, and received customer's comments through January 6, 1986.

In response to requests by the customers, Western held an additional public comment forum on February 12, 1986, to receive additional comments and identify specific items of data, information, or analysis that the customers required of Western in order to comment on the revised proposed General Regulations.

Western has prepared responses to these comments and has sent them to the Federal Register for publication. This current Notice will request additional comments on the revised proposed General Regulations within 30 days of publication. Western will review all comments received and then publish final General Regulations for the Charges for the Sale of Power from the Boulder Canyon Project as soon as possible after the comment period closes. To assist customers in this process Western is providing, by separate mailing, to those interested parties, copies of all the data and documents referenced in the Federal Register Notice.

Question: What effect, if any, will the new rate schedule for Hoover power have on the FY 87 budget for WAPA?

Answer: In FY 1985, pursuant to the Hoover Power Plant Act of 1984, a revolving fund was established to provide for the operation, maintenance, and replacement costs of the Boulder Canyon Project. These costs are to be offset by revenues. Therefore, the new rate schedule will have no impact on Western's FY 1987 budget. However, it is anticipated that the present rate level for Hoover power will increase with the implementation of the new rate schedule on June 1, 1987, due to the additional costs authorized by the Hoover Power Plant Act of 1984; specifically, the construction of additional visitor facilities, the uprating of the Hoover powerplant generator capacity, and the addition of the contribution to the Lower Colorado River Basin Development Fund.

Question: Several of the Hoover customers in Arizona, Nevada and California have raised concerns about how the rates are being set and the criteria that is being used in making the determination. What action have you taken to deal with the concerns that have been raised?

Answer: Throughout the rulemaking process Western has indicated that as long as the collection of adequate revenues was assured, Western would seriously consider any rate design which the allottees could agree upon and which did not violate the law. In order to reconcile their differences, the customers requested a 90-day delay in the proceedings, which Western granted on July 1, 1985.

During the ensuing period, Western met, and continues to meet, with interested parties in order to more clearly understand their positions, answer their questions, and provide additional information and data to help resolve any differences relative to the proposed General Regulations.

One of the major differences identified was the rate design of the Base Charge and the Lower Basin Development Fund Contribution Charge. The customers were unable to come to a consensus on the design of the capacity and energy components of the charges for power from the Boulder Canyon Project and submitted, to Western, three separate and differing proposals for these charges. Western then proposed a new rate design in the revised proposed General Regulations. In developing the new rate design, Western considered all comments received and has attempted to minimize the disparity of the economic impacts of the individual customers.

Western has met with, and will continue to meet with, the interested parties to achieve a consensus while maintaining the financial integrity of the Boulder Canyon Project. Western will continue an open and public process in order to satisfactorily resolve the expressed concerns and prevent any delays in the completion of the rulemaking and contracting process.

Question: It is my belief that there exists a special role for Western Area Power Administration to set the Hoover rates in such a way as to try to avoid legal entanglements that would endanger progress on the uprating process which in turn could affect the CAP repayment schedule. Could you detail the actions that you have taken to assure that all possible views and avenues have been explored in setting these rates so that legal entanglements can be avoided?

Answer: Western recognizes its role in providing for the required contribution to the Lower Colorado River Basin Development Fund to accomplish the timely Central Arizona Project repayment.

Throughout the rulemaking process, Western has and will continue to subject its actions, information and responses to thorough legal review to ensure that they are within the authority granted by the various laws, directives, orders, and regulations which govern Western.

The numerous meetings, comment forums and Federal Register Notices attest to our deliberate and cautious approach to setting the new Hoover rates to ensure the timely progress of the Uprating Program. In any event, the CAP repayment will not be affected as the four and one half mill per kilowatt hour contribution charge will be assessed on each kilowatt hour of energy sold in the State of Arizona whether the Uprating Program is delayed or not. The energy associated with the Uprating Program will be available on June 1, 1987, thereby, assuring the CAP of the revenues anticipated by the passage of the Hoover Power Plant Act of 1984.

Question: It is my understanding that the goal is to have the regulations issued in a manner that allows the contracting process with the utilities to begin this June. Are you going to be able to meet that timeframe? If not, why not?

Answer: Western hopes to complete negotiations and have contracts ready for execution by June 1, 1986. Although the schedule is ambitious, Western is undertaking several concurrent actions, such as proceeding with contract negotiations in parallel with the development of the General Regulations in order to ensure meeting the June 1, 1986, date. This is necessary to assure continued Uprating Program progress. Western and the future customers have agreed that contract negotiations can proceed on those topics which are not specifically addressed in the proposed General Regulations. Western will commence contract negotiations beginning the week of March 24, 1988.

After the proposed General Regulations are finalized, those specific contract topics addressed in the regulations will be incorporated into the power contracts. Western believes that the June deadline can be met with the above understanding and the continued cooperative efforts of the Hoover customers.

SUBCOMMITTEE RECESS

Chairman HATFIELD. The subcommittee will recess until the call of the Chair. I want to thank Miss Fitzpatrick, Mr. Johnson, Mr. Cross, Mr. Geisinger, Mr. Wilkerson, and Mr. Clagett for your very excellent testimony and your assistance to this committee and its deliberations.

[Whereupon, at 3:13 p.m. Thursday, March 20, the subcommittee was recessed to reconvene at 10 a.m. Monday, April 14.]

ENERGY AND WATER DEVELOPMENT APPROPRIATIONS FOR FISCAL YEAR 1987

WEDNESDAY, APRIL 23, 1986

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 2:25 p.m. in room S–126, the Capitol, Hon. Mark O. Hatfield (chairman) presiding.

Present: Senators Hatfield, Johnston, McClure, and Cochran.

DEPARTMENT OF ENERGY

NAVAL NUCLEAR PROPULSION PROGRAM

STATEMENT OF ADM. KINNAIRD R. McKEE, U.S. NAVY, DIRECTOR, NAVAL NUCLEAR PROPULSION PROGRAM

OPENING REMARKS

Chairman **HATFIELD**. The hearing will please come to order. I apologize for being late. I was taught in the Navy to hurry up and wait, and to be on time and punctual. [Laughter.]

Admiral **McKEE**. We used the time to good advantage.

Chairman **HATFIELD**. Good. It has been so many years, I guess I have lost the training.

Admiral **McKEE**. I bet you haven't.

Chairman **HATFIELD**. The purpose of this hearing today is to hear the testimony on the fiscal year 1987 budget proposal for Atomic Energy Defense Activities within the Department of Energy.

Our first witness will be Adm. Kinnaird R. McKee, Director of the Naval Nuclear Propulsion Program.

Later, we will hear from Admiral Foley, General Davis, and General Abrahamson regarding nuclear weapons programs of DOE.

On behalf of the committee, I welcome you, Admiral, and the rest of the witnesses today. We are very happy to have you here and we will have your entire statement printed in the record. We would invite you to summarize it as you will or to highlight it as you wish.

So, Admiral, please proceed.

Admiral **McKEE**. I will take advantage of your offer to put my statement in the record. I would like to go right into describing my activities and my budget.

I have with me three people from my staff: a naval architect and two controllers.

Chairman HATFIELD. Would you give us their names for the record?

Admiral McKEE. Yes, sir. They are Mark Forssell, Tim Foster, and Gary Olson.

Chairman HATFIELD. We are very happy to have you gentlemen accompany the admiral.

Admiral McKEE. All right, sir, I will give you an overview of my program—where it stands today, how I intend to use the money, and to what purpose during the next fiscal year.

RESPONSIBILITIES

As you know, Senator, I have a cradle-to-grave responsibility for all aspects of naval nuclear propulsion.

We develop the propulsion plant, follow ship construction and operation, train the people, and, in the end, we dispose of the reactor compartment. Every step of the way is our responsibility and this is a summary of those responsibilities.

I won't dwell on all of them but I will discuss several which I think are important issues today. One is reactor safety and the second is control of radiation and radioactivity. I deal with very large amounts of radiation and radioactivity. The whole idea is to keep it in the plant. I will also talk about my research and development and the work I am doing in design getting ready for the new submarine.

REACTOR SAFETY

Perhaps the largest vulnerability that my program has is its excellent safety record. It makes things look too easy. Over some 30-odd years of operation we have yet to have a reactor accident. We have yet to have any release of radioactivity that has affected the quality of the environment or the people, and the annual amount of radioactivity we put in all the harbors we use is less than 0.002 of a curie.

Senator, you could put what we release to any harbor in your glass of water and drink it and it wouldn't hurt you. That is from any harbor, which may have as many as 20 or 30 submarines in it.

To put that in perspective, and I think a perspective is needed once again, because it sounds too glib and too easy. [Deleted.]

Chairman HATFIELD. Excuse me, Admiral. Let me just make clear for the record that everyone in the room has the required security clearances.

Admiral McKEE. Yes sir; my three guys have.

Chairman HATFIELD. Thank you.

Admiral McKEE. [Deleted.]

Senator JOHNSTON. [Deleted.]

Admiral McKEE. [Deleted.]

PROGRAM STATISTICS

Our nuclear ships have over 65 million miles and we have trained 66,000 operators. Yet, this is really a pretty small outfit.

The nuclear navy at the present time includes 157 ships, with 28 ships authorized and under construction. The additional ships are submarines and aircraft carriers. As you know, we are not building nuclear-powered cruisers at present.

To give you a fiscal perspective on that, most of those ships are submarines.

Of the total defense budget, submarines are about 5 percent and that includes the Trident and Poseidon ships. The platforms for the entire sea-based strategic deterrent represents about less than 3 percent of the defense budget.

We think that is a bargain.

In specific terms of my Energy Department budget that I am presenting to you today, we are about 5 percent of the DOE budget. So we are a relatively small operation.

I chose this year to look at my work in financial terms more than I normally do. I pay a lot of attention to good stewardship, but it occurred to me, as I considered some of the pressures that I have to deal with, what really are my tasks.

We have a major investment in the nuclear navy. Even though the percentages are small, we have well over $100 billion dollars invested in these nuclear-powered warships. They represent 40 percent of the combat ships in the Navy.

We must protect that investment. One mistake, one accident, or even the perception of an accident would change the entire character of the Navy.

So I have two jobs. First, I have to protect that investment by making sure that I continue to man the ships with people who can operate them. And remember, we are in the hands of very young men, Senator.

The enlisted men running these reactors are recent high school graduates. These are not people with advanced degrees. The officers have college degrees but not the guy that actually does the work. Most of the people in my program are high school graduates.

We also have to overhaul and repair the ships for a reasonable amount of money. A significant amount of our research and development goes into making sure that our existing ships continue to operate successfully.

We designed these ships to go for 20 years. We currently have been told to take them to 30 years and to take the surface ships as far as 45 years. So to do that requires a lot of research and development, particularly in materials that you would not expect to find.

The rest of our work is in the business of enhancement. We can't just live forever with what we have now. We have to continue to grow and that requires research and development and procurement in new classes of submarines and, particularly important, folding the operating experience that we have now into new developments so that we can operate more safely and more effectively.

That is the prologue.

NAVAL NUCLEAR PROPULSION WORK

I will not spend a lot of time in detail on the work that I have to do in 1987 as you are familiar with it. Those are our significant efforts. Operating reactor support involves the work we have to do to make sure that we continue to operate safely and effectively.

Reactor performance improvement includes part of that, plus new developments for new applications as does component improvement.

Material development is a critical element of all of the work we do. The materials that we put in these reactors operate in a heavy radiation environment for as long as 20 years, [deleted] and we can't go in and fix them. Once they become irradiated, we can't touch them. So we have to do it right the first time and that puts a heavy load on material development and certification.

ADVANCED REACTOR CONCEPTS

Now, I will talk about the fuel factory, the prototypes, the water-cooled breeder, and the advanced work.

You authorized the money to build a second fuel factory. You may have read that our single fuel factory in Tennessee has been having lots of labor problems in the last year. The company just solved those and they are back in production, but it was a farsighted action on your part to give us the money to build a second factory. We would not be in a position to get fuel today had this not been done. The new fuel factory down at the Savannah River site will come on the line this year on time and within cost.

I also have a responsibility for prototype reactors ashore. These are the equivalent of a seagoing reactor, but ashore for research and development. They were built in advance of the first shipboard plant and continue in use for fundamental research and development and training.

They range in age from 10 to 33 years.

Senator JOHNSTON. Why do you need a breeder reactor?

Admiral MCKEE. I don't have a breeder reactor anymore, Senator. The breeder reactor was an experiment to prove that you could breed in the light water environment. That was a civilian project that had nothing to do with nuclear-powered ships.

We did that as an experiment overlaid on the Shippingport experiment Admiral Rickover did. The Shippingport was the first commercial powerplant. We finished the light water breeder experiment and we are in the final stages of wrapping it up now.

Our program has had a responsibility in the civilian side almost from the beginning. Much of the commercial nuclear technology that is in place today came from our program, but we are getting out of that business.

The point is, with these old prototype reactors we have to spend a lot of money to keep them operating safely. They are very valuable test facilities. As luck would have it, virtually all need refuelings or overhauls in this 10-year period, where only two of them had to be refueled in the last 10 years. That consumed a good bit of our resources.

To give you an idea of what I mean, we have to do eight major servicings and quite a number of interim overhauls. It is a lot of work and it is not inexpensive.

MOORED TRAINING SHIP DEMONSTRATION

We will be retiring the first prototype. It is out in Idaho, Senator. It will go out of commission in the late 1980's and will be replaced by the moored training ship *Demonstration*.

What we have done is use one of the Poseidon submarines which came off the line for SALT.

We have cut it in half to take the missile compartment out. We are going to put it back together to use as a floating training facility to do the same sorts of training evolutions that we have been doing with the Nautilus prototype all these years.

We will save a lot of money by doing it that way.

LIGHT WATER BREEDER PROGRAM

The Light Water Breeder Program you asked about is in the final stages. It has been defueled. The Shippingport site has been turned over to other parts of DOE for cleanup. We are working out at the naval reactors facility in Idaho to prove that breeding did occur. That is the essential element of the experiment and we are documenting it all so it will be ready for industry to use.

To give you an idea of the funding aspects of it, I will give you a perspective. The whole program costs less than 1 year of funding for the liquid metal breeder work at its height. So it is not a big program by contemporary standards.

To give you a reference, the remaining cost represents about 2 percent of the money we have spent since the program started. This is what is left to do and we will finish in 1987.

NEW ATTACK SUBMARINE

Our major programmatic effort is the advanced fleet reactor. This is the new reactor for the new SSN-21 submarine. That is what I brought these models in for. That is a model of the new Soviet submarine *Akula*, and I will talk a little bit about it.

This is the [deleted] submarine they have [deleted] put to sea and I brought a 3-D model because it is important to get that perspective to compare it. We have always been accused of building big submarines while they build little ones. This is theirs. That is our 688-class submarine. Theirs is much bigger.

The new submarine we are getting ready to build will look like this model. That is the boat I am going to talk about.

Senator JOHNSTON. Is it an attack submarine, you say?

Admiral MCKEE. It is an attack submarine.

Senator JOHNSTON. Why would they have the big one for an attack?

Admiral MCKEE. The Soviets have to build size into an attack submarine if they are going to be able to put a lot of power in it [deleted].

If you are going to put that investment in the propulsion plant, you might as well put an investment in weapons. It tends to make the boat bigger, [deleted]. It is a pretty good looking boat, too.

Senator MCCLURE. How do they compare on quietness?

Admiral MCKEE. I will show you.

It is interesting, too, you know, we study while the Soviets build. [Laughter.]

When we were at the point we are now in our new submarine with the *Los Angeles* class, I was a lieutenant commander. That is the last new attack submarine we have built.

Chairman HATFIELD. You advanced very rapidly. [Laughter.]

Admiral MCKEE. And Admiral Foley here was a JG. [Laughter.]

It is interesting. The intelligence folks tell us that when *Los Angeles* went to sea and performed as well as she did, the Soviets started the *Akula* project and brought it to fruition just about the time we hoped to get going on our new submarine project.

SSN-21 IMPROVEMENTS

The new submarine is designed to have a number of advantages and improvements over the 688 and over the opposition. It is supposed to be quieter, faster, dive deeper, carry more weapons, be tougher, able to withstand more battle damage, and stay on the line longer while carrying a much heavier payload overall [deleted].

The reason I bring these submarines up here is not because I am here to advertise the whole submarine. My business is the propulsion plant, but none of the other advances can be achieved unless we achieve the goals that we have set for ourselves in the propulsion plant.

Senator JOHNSTON. Can you tell me quickly, Admiral, why it is that an attack submarine is so much better than a surface ship for attacking other submarines?

Admiral MCKEE. For one reason, you always know when a surface ship is coming. A submarine, a quiet submarine, will always get to shoot first, and that is a big deal if you get to shoot first.

Another reason is that a submarine is designed to operate alone and unsupported in waters controlled by the enemy, so a submarine can go all by itself well up into the backyard of the other guy and get them where they think they are safe.

A surface ship simply can't do that. He has to take a lot of folks with him. He has to take air cover with him and other support. So there are significantly important portions of the ocean where the other guy is most vulnerable and only submarines can operate easily.

Finally, the Soviets intend to use the Arctic extensively and the only thing that can work up there is a submarine. So that is why it is important.

ACOUSTIC PERFORMANCE

You asked about how quiet. Generally we can talk about what is quieter than what, but you have to look at quieting across the speed range. The faster a ship goes, the more noise it makes. To give you an idea, a modern submarine, such as 688 class, is relatively quiet until it gets to about [deleted] and then as it goes faster, the [deleted] noise begins to grow. That is a problem until it gets to the point where the [deleted] .

Let's look first at where the operational Soviet submarines are today in comparison with the 688. With our most modern sonar, we can pick up [deleted] . So there is a substantial difference. That is the acoustic advantage.

The *Akula*, the boat I have [deleted].

However, at higher speeds, *Akula* has [deleted] problems that drive its noise emission up. Our job in the new design submarine is to build a boat that will be so quiet [deleted] that there is no difference.

[Deleted.] that is the task that we have set for ourselves.

Senator McClure. That is the task. Do you really think it is realistic?

Admiral McKee. Yes, sir; it is.

Senator McClure. As shown on the graph?

Admiral McKee. Yes, sir; we can do that. It is a different process. Admiral Rickover used to say, "Making it nuclear is easy now. Making it quiet is very hard." We are doing things in this effort that are far more complex. We are looking at noises we never paid any attention to before.

For example, we didn't care what [deleted].

Perhaps one of the most significant improvements is [deleted], and I will talk to you about that. We are going to put that to sea well ahead of the boat. [Deleted.] By designing the reactor the way we are going to do it [deleted].

There is a lot of development that is going on for the submarine as well as the propulsion plant. That is not in my program, but I just thought I would show it to you really in regard to your question, "Can you achieve it?"

These are submarine developments that have to be brought to fruition for this submarine to do what we need to do and these are features that will be at sea long before the new submarine has gone to sea. They will be at sea in other applications.

In my business, our task translates into making a plant that is quieter, has substantially better power density—by that I mean power per unit weight—and from the standpoint of cost effectiveness we have to make it as producible as we possibly can.

The developments that I am involved in are primarily being done under my DOE hat, although some of that is being done with Navy money as well, because the Navy owns a stake in quieting. But I also am responsible for the design of the entire propulsion plant, including the work that is being done by the rest of the Navy.

The end product will be a reactor plant that will be [deleted] more powerful than the 688 and only [deleted] heavier. That is what gives us the agility we must have in this submarine.

SUBMARINE DETECTION

Senator JOHNSTON. Admiral, given adequate funding, do the oceans continue to be more opaque rather than more translucent as the Chief of Naval Operations used to say?

Admiral MCKEE. Yes, sir. They only get translucent at budget time when the Air Force testifies. [Laughter.]

It gets harder and harder and harder to find a submarine. The environment in the ocean is terribly difficult to predict and is subject to all kinds of vagaries that just compound and any physical approach makes it extraordinarily difficult. The ocean is not going to become transparent in my lifetime, sir, and probably not in the lifetime of this ship.

One never knows what may be in the middle of the next century, but nobody has seen anything that offers any prospect of a system that would put a submarine force at risk.

There are always things that will find a submarine in a place if you know when and where to look. But for submarine force vulnerability to make any sense, an antagonist has to bring, at risk, most of the submarine force, all at the same time, or there is no vulnerability at all in the strategic sense.

That is virtually impossible. We have even postulated hypothetical devices and tried to run them against that kind of distribution. It just doesn't make any sense.

To get the SSN–21 as quiet as we are talking about, can we do it? We have to do a number of things. I won't go through all of them, but this is a list of what we have done and have not done before. We have a test facility [deleted].

[Deleted.]

We are also building a quarter-scale model of the submarine [deleted].

Those are very important to us.

We also mockup the whole plant in wood to make sure it makes organizational and technical sense.

The [deleted] is a DOE facility at the Bettis Laboratory. As I said, [deleted]. We will actually build the entire reactor with no active material [deleted].

SSN–21 STATUS

To put in perspective where we are, the conceptual design and preliminary design has been completed and we are coming to the end of contract design for the ship. But in order for me to validate the design features, I had to start work much earlier.

I am already in detail design of the plant and major components are already in procurement for use in testing. I will build a core and put it in an existing prototype plant rather than build a new plant. That will save a lot of money as well. With some plant modifications I can get an equivalent test out of that.

Although at some point in time within the next few years, we will need to build a next generation plant and a new prototype. There is some seed money in the budget for that.

PROGRAM BUDGET

Now what does that all cost? To put it in perspective, my budget submission in 1987 was $20 million under the target that we were given earlier and which represented about a 3-percent increase over the prior year.

That number did not have the Gramm-Rudman impact figured in, but the 1986 number now has the Gramm-Rudman percentage applied so there is an apparent growth here that wasn't there before. It did not originate in my program.

Senator JOHNSTON. Why are the operating expenses so much larger than capital equipment?

Admiral McKEE. Well, let me show you where my operating expense money goes. I have a large capital plant in operation, but I just don't buy a lot of things every year. We are really a pretty low-budget outfit in that regard.

If you put both my laboratories together, there is less floor space than the smallest of the DOE weapons laboratories and one-tenth of the computer capacity. They need that; I don't. So we don't buy it.

Much of my operating expense money goes to operate and maintain the prototypes and keep them operating safely. I have to spend some money on the advanced test reactor out in Idaho. That is a facility which belongs to others in DOE, but I am the only customer, so I pay most of the support.

Research and development, materials evaluation, plant development are major expenses, and about 23 percent of my funds go toward the advanced fleet reactor plant I was showing you for the new submarine.

Mr. Chairman, that is all I came with, in a formal sense.

[The statement follows:]

STATEMENT OF ADM. KINNAIRD R. MCKEE

Fiscal Year 1987 is a critical year for the Navy and the Naval Nuclear Propulsion Program. A confluence of several current events could profoundly affect the Navy's nuclear powered fleet, including those ships now in the inventory, those we expect to build, and the men who will sail them. One of these is our request for initial funds to procure long lead material for our first new design attack submarine in twenty years, the SSN-21 -- SEAWOLF. However, before discussing SEAWOLF, I would like to bring you up to date on the overall program.

We now have 177 naval reactor plants in 149 ships and eight land-based prototype plants. Nuclear-powered ships now comprise more than 40% of the Navy's combatant fleet. Last year we added four more ships to the fleet, and we have 27 additional ships authorized or under construction. Our responsibility for safe and reliable nuclear propulsion plant operation continues to expand as the fleet grows and ages. Half our operating ships are approaching their initial design lifetimes.

Our nuclear-powered ships represent a highly leveraged investment in national defense. When their contribution is weighed against their relatively small and stable resource requirements, it becomes apparent just how good a bargain these ships really are. But we must remember that this leverage works both ways. The potential impact of an apparently small pro-rata reduction on safety and operational effectiveness is way out of proportion to its real dollar value.

Nuclear-powered ships have now steamed over 65 million miles, without a reactor accident and without release of radioactivity having a significant effect on the environment. This record reflects the continuous adherence to high standards and technical integrity which have been the hallmark of the Naval Nuclear Propulsion Program since its inception.

We have had a wide margin of superiority over the Soviets in all aspects of submarine warfare. Though the Soviets outnumber us, we have been able to count on technical superiority to help even the odds. The Soviets have now substantially closed that gap, and are near technical parity in undersea warfare. Last year I told you they had introduced four new attack submarines in the last three years. We now know that the latest has substantially reduced our performance margin. For years we have had the best people and the best submarines, but if this trend continues, the principal difference may only remain in the skill of the operators.

Many will probably view these reports of Soviet improvement with suspicion -- are they really that good? Others have asked how the Soviets could achieve their present levels of performance when many intelligence indicators predicted this would not happen until the next decade. Why were we "surprised"?

Well, the Soviets are that good, and we are not surprised. My principal feeling after the first intelligence briefing on the new Soviet boats was one of great disappointment, because it was clear that we were party to the event. In the mid-1970s, the Soviets saw what the 688 Class could do and immediately redoubled their efforts to catch up. The product of that effort is now at sea and operating well.

Even so, we are not yet too late. 688s will have a tough time with the best of the new Soviet submarines, but they will still be able to handle them -- for a while. It is with the next Soviet generation in mind that we have laid the groundwork for SEAWOLF.

More has been done to tailor SEAWOLF to specific military requirements than any submarine since NAUTILUS. She will be quieter, faster, and more powerful than any of her predecessors. The Naval Reactors Program is developing a propulsion plant which will deliver significantly more power at about the same size and weight as our existing plants. The SEAWOLF reactor will be more efficient and quieter at all speeds than any preceding plant. She will also have significantly improved secondary machinery.

We need SEAWOLF as soon as possible. Our initial intention was to seek a Fiscal Year 1987 authorization for the first of the class, but fiscal pressures and the technical challenge inherent in the design made it clear that a Fiscal Year 1989 authorization was better. The present schedule will get her to sea in Fiscal Year 1995, and we are on schedule. Contract design will be completed this fall, and competition for detailed design will follow. The design of all major propulsion plant equipment is well along, as is the test program that supports design decisions for long lead components. Fiscal Year 1987 advance procurement funds are needed for equipment, including the reactor plant, which is critical to meeting the ship construction schedule.

We are proceeding at a very deliberate pace for the sake of economy and technical conservatism. We are spending more time in the design and development phase of SEAWOLF than for any prior submarine. To put that in perspective, consider the crew who will man the ship. SEAWOLF's first Commanding Officer is currently a junior Lieutenant. He has probably just qualified in submarines. His Executive Officer is probably an Ensign. The CPOs are Second or Third Class petty officers. The rest of the officers and crew are still in high school and college.

At the same time, we are mindful of the difficult budget situation this year. Major uncertainties have been inserted into the process. The choices will be hard, but arbitrary pro-rata cuts are not the answer. Some things are inherently more important than others. Safety and operational effectiveness deserve special attention. Like any good banker, we should invest our available funds in those things that provide the greatest return.

And no matter how tight things get, we can't afford to neglect the future. SEAWOLF is a critical investment -- one which must be made now. We are late, but not yet too late to preserve our advantage. We must support what we have set in motion. Otherwise, we will concede superiority in one of the few areas where we now hold an unequivocal advantage. Even more, we may also put our entire strategic and tactical investment in nuclear-powered ships at risk.

A man who owns a fine home cannot afford to skip his insurance payments -- he puts at risk not only his most important investment, but also perhaps his way of life, all for relatively small short-term savings. The same thing can happen to the nuclear Navy. Congress has always recognized this, and has supported the Program well.

Naval Reactors Development Budget Request

The Fiscal Year 1987 budget contains the funds I need to do my part toward getting SSN-21 to sea. In Fiscal Year 1987, our Advanced Fleet Reactor work begins to coalesce, with continued development of new fuel concepts and the procurement of prototype reactor components. Many of these components will be tested for acceptable noise performance in dedicated laboratory facilities prior to their installation for testing in an operating reactor plant.

The eight prototype naval reactor plants are essential to the design, development, and proving out of new concepts instrumental to improving naval reactor plant performance. Only by operating resulting developmental items in a controlled, land-based environment can we prove them sufficiently to warrant a committment to shipboard use. Servicing the prototype plants is necessary to continue their safe and effective operation -- these plants are also one of the essential elements in training the Navy's nuclear plant operators.

Our Fiscal Year 1987 budget request includes $529.8 million for Operating Expenses, a fourteen percent increase over my Fiscal Year 1986 appropriation, as adjusted by the Gramm-Rudman-Hollings Act. Roughly a third of the increase is due to escalation. The remainder comes from the need to do greater amounts of servicing on more prototype plants, replacing significant equipment for the Advanced Test Reactor in Idaho, and continuing to build the Advanced Fleet Reactor prototype core and components.

Capital Equipment requirements in Fiscal Year 1987 are $51.7 million, a growth of $26.4 million. The majority of this increase is to replace a scientific computer system at the Knolls Atomic Power Laboratory. Fiscal Year 1987 Construction funding has decreased $34.2 million from Fiscal year 1986, due to completion of the Materials Facility and Modification sand Additions to Prototype Facilities construction projects. The details of the request by major area are:

		Budget Authority (in millions)
Reactor Development		
Operating Expenses	$274.0	
Capital Equipment	51.7	
Construction	12.1	
Subtotal		$ 337.8
Plant Development		
Operating Expenses		71.0
Reactor Operation and Evaluation		
Operating Expenses		173.0
Program Direction		
Operating Expenses		11.8
TOTAL NAVAL REACTORS DEVELOPMENT		$ 593.6

Reactor Development

The Advanced Fleet Reactor, which will power the next generation of attack submarines, will be a higher power reactor incorporating the latest quieting techniques. The majority of the Advanced Fleet Reactor effort involves reactor development work, which will include: completion and qualification of component and system designs and fabrication of the prototype core and components; completion of the final design for the core instrumentation, reactor vessel and closure assembly and associated reactor equipment; shock test of a full size dummy core module; and preparation for component and system testing.

An extensive technology effort is carried out to develop and test materials, nuclear fuels and poisons, computer programs, design concepts, and manufacturing techniques; obtain and evaluate data from operating plants and ensure reactor plant safety. Development of improved materials and higher density fuel and poisons is of central importance to achieving high power, longer life cores and better reactor components. Improved materials, fuels and poisons allow designers new approaches to optimize core depletion rates while minimizing adverse material conditions. An acceptable design requires an optimum balance between the competing requirements of performance, servicability, and reliability. To aid in this work, the laboratories develop highly sophisticated computing codes and capabilities to determine and evaluate the interrelationships within the reactor and between reactor systems and components. The laboratories also develop better production processes to realize these performance gains reliably and efficiently at minimum cost.

Testing of candidate materials, fuels and poisons, and new cores and components goes on for years, and continues after an item is introduced into the fleet to ensure data is available ahead of fleet experience. Data obtained from operating fleet plants and through examining spent cores is also a valuable source of information for new reactor designs and safety evaluations.

Work underway will include fabricating the Developmental Materials Core which will be used to prove out new materials and material concepts, completing the qualification of a second source of supply for naval nuclear fuel material, examining expended cores and irradiated test specimens, developing advanced core and reactor concepts, continuing refinement of the Modified Fuel Process, selecting an advanced fuel element manufacturing process for irradiation qualification and vendor development, replacing the beryllium shield components for the Advanced Test Reactor, continuing research into thermal hydraulic processes, and determining mechanical properties of reactor components.

Capital Equipment

We need to replace the 17-year old computers at the Knolls laboratory. This is the main cause for the increase in capital equipment funds. The remaining funds will be used to replace aging equipment in the laboratories and prototype plants and upgrade efficiency in test and analytical areas.

Construction

Construction fund needs drop substantially. The principal requirements in Fiscal Year 1987 are to start upgrading the Kesselring Site Facilities to handle the prototype plant servicing work and to put an addition on the Bettis computation facility to accommodate needed computer and support equipment and security improvements. General Plant Project funds are needed to maintain the laboratories and provide test facilities.

Plant Development

The overall performance of a nuclear propulsion plant depends on the capabiities of all systems and components. Maximizing the performance gains acheived through advanced reactor designs requires corresponding improvements in all other components and systems.

Toward this end, we carry out plant arrangement optimization studies, instrumentation design and development, and primary plant fluid, mechanical and electrical system development. We are working to ensure safe and reliable plant operation. For instance, water and radiation are corrosive agents which limit component performance over the long term, leading to operational restrictions and costly overhauls and equipment replacement. We are finding ways to improve water chemistry and purification methods, develop corrosion resistant structural materials and come up with better methods to decontaminate plants.

We are also evolving better means of quality control and carrying out facility decontamination work. This work will continue in FY 1987.

Reactor Operation and Evaluation

Naval Reactors operates eight prototype naval nuclear propulsion plants to test new cores, components, and systems, and to train Navy personnel as reactor plant operators. New equipment is subject to a number of tests during development, but final design confirmation is only possible through testing in these plants. This approach allows several years of operating experience prior to fleet application. We continue to operate new equipment in the prototypes after fleet introduction to uncover problems before they are encountered in the fleet.

In 1984 we commenced an extended period of servicing the prototype plants which will continue into the early 1990's. This is a growing effort. In addition to inserting new test cores and components, we will overhaul the plants. The work is more extensive than previously conducted due to the increasing age of the plants, which now average 25 years. The experience gained and methods used in this work is directly applicable to the fleet plants, whose average age is also increasing.

Program Direction

This area provides salaries and associated costs for the 213 full-time Energy Department employees in my office and in my Pittsburgh and Schenectady field offices.

These people are crucial to our ability to develop SSN-21 as well as support operating ships. Their responsibilities continue to grow as rewards and staffing remain constant. We cannot afford to take their dedication for granted.

Water Cooled Breeder

Fiscal Year 1987 also sees the completion of my civilian nuclear energy program -- the Water Cooled Breeder effort. Twenty years of work on this program culminated with successful operation of the Light Water Breeder Reactor core in the Shippingport Atomic Power Station for five years. The core is now at the Expended Core Facility in Idaho where we are confirming the performance, which is expected to prove that breeding can be achieved in a light water nuclear power plant. This will confirm a practical way to use thorium, a plentiful fuel for which there has been no major energy-related use.

The FY 1987 Water Cooled Breeder Budget request is $13.8 million. This is $5.2 million less than the FY 1986 appropriation as adjusted by the Gramm-Rudman-Hollings Act. The major areas are:

	Budget Authority ($ in millions)
Operating Expenses	
Defueling Activities	$ 3.6
Core Evaluation	$10.2
Total	$13.8

Defueling activities will consist of: spent fuel handling and shipment to the Idaho Chemical Processing Plant for long term storage; cleaning up light water breeder reactor facilities; and publishing final reports on defueling activities.

Core evaluation work will include: completing non-destructive assay of about 3% of the light water breeder core's fuel rods to confirm breeding, disposing and cleaning up examination equipment at the Expended Core Facility, completing core and structural materials examinations, and documentation of the final program results for use by industry.

The Argonne National Laboratory will complete cleanup and waste treatment activities associated with their chemical analysis work which is funded under the DOE Fuel Cycle Program.

SUBMITTED QUESTIONS

Chairman HATFIELD. Admiral, you give me particular reason, and all of us for that matter, to be proud of the Navy's record in safety and other parts of your program.

Admiral McKEE. Thank you, Senator.

Chairman HATFIELD. You have no ships in the submarine fleet, only boats; is that correct?

Admiral McKEE. Submarines are boats; surface ships are ships. That is an old tradition from the time there used to be torpedo boats. They called them submersible torpedo boats. I guess we call Trident submarines ships because they are so big, but I am sorry if I slipped back into my old lingo.

Chairman HATFIELD. I just wanted to update you on what I understood. [Laughter.]

Admiral, also I wonder if you would write me an excuse today to the Superintendent of the Naval Academy for my absence at the Board of Visitors meeting which I was scheduled to attend, but canceled, so I could hear you today.

Admiral McKEE. I appreciate that very much.

Chairman HATFIELD. Senator Johnston, do you have any questions?

Senator JOHNSTON. No, Mr. Chairman, except to echo your comments about the Admiral, his program, and the great record that he has made. It is very persuasive and an excellent presentation.

Chairman HATFIELD. Thank you, Admiral, we do have a number of questions that have been prepared by staff and we will present those to you and we would like the response as soon as possible.

Admiral McKEE. We would be happy to do that.

Chairman HATFIELD. Senator McClure.

Senator McCLURE. I have no questions, Mr. Chairman.

Chairman HATFIELD. Thank you very much, Admiral.

[The questions and answers follow:]

QUESTIONS SUBMITTED BY CHAIRMAN HATFIELD

Naval Fuel Factory

Question: Describe the status of the Materials Facility Construction Project at Savannah River.

Answer: The Materials Facility is expected to be completed in the next few months and will provide a second source for the manufacture of Navy nuclear fuel. Design work and delivery of facility equipment are essentially done and construction is 98% complete. As portions of the facility are completed they are being turned over to operations personnel who conduct equipment and facility checkout and carry-out start-up procedures prior to beginning fuel processing operations. Fuel processing is expected to begin this year.

Question: What is status of the fuel fabrication facility at Erwin, Tennessee? Do you expect this facility to continue in operation for the foreseeable future?

Answer: The strike at Nuclear Fuel Services (NFS) in Erwin, Tennessee, is over and the company is working to get back up to full production under the current contract which will run about two more years. The facility is expected to continue in operation for the foreseeable future thereafter.

New Attack Submarine

Question: Please describe the progress being made on the Advanced Fleet Reactor.

Answer: All of the Advanced Fleet Reactor's basic features have been decided upon and work continues to proceed on schedule. Testing and analysis to date indicate the reactor should meet performance requirements. A lead control drive mechanism and test module have been completed and fabrication of several major prototype test components is underway. [Deleted]. Additionally, fuel element and structural fabrication development and material procurement to support core fabrication is on schedule.

Question: How will the SSN-21 Class be an improvement over our current attack submarines?

Answer: In summary, SSN-21 will have greater usable tactical speed and depth, superior acoustic performance, greater firepower, better target detection and engagement potential, improved Arctic operation capabilities, and greater resiliency than SSN-688 Class submarines.

Submarine Capabilities

Question: Please describe the relative capabilities of the United States and the Soviet's submarine fleet.

Answer: Although the Soviet submarine fleet has outnumbered the U. S. submarine fleet by nearly three to one over the years, the U. S. has been able to maintain technical superiority in submarine design and performance. However, during the past decade, the Soviets have introduced several new classes of nuclear powered submarines which have diminished our technological advantage. [Deleted.]

Question: Please describe the advances you see necessary for the United States to maintain its nuclear strength compared to the USSR.

Answer: To counter the threat I have just outlined, a new attack submarine is needed to maintain our qualitative advantage over the improving Soviet submarine fleet into the next century. SSN 21 will be that submarine. [Deleted.] Additionally, SSN 21 will be faster, more powerful, and carry a larger weapons payload than her predecessor, the 688 Class. While significant improvements are being made to the 688 Class, the basic design is over 20 years old.

Shipbuilding Status

Question: What is the status of the DOD shipbuilding program with regard to nuclear submarines and surface ships?

Answer: We are building three different classes of nuclear powered ships, as follows:

	Authorized	Delivered	Under Construction
SSN 688 Class Attack Submarine	52	33	19
TRIDENT Ballistic Missile Submarine	13	7	6
CVN 68 Class Aircraft Carrier	6	3	3

The FY 1987 Navy budget requests funds for the construction of four SSN 688 Class submarines and one TRIDENT submarine, and advance procurement funds for the SSN-21.

Naval Reactors Development Budget

Question: Please describe the need for the significant increase in operating expenses.

Answer: The primary cause of the operating expense increase is due to an increase in prototype plant servicing work. Approximately $28M of the operating expense increase is due to this work. The Naval Nuclear Propulsion Program operates and maintains eight land-based prototype plants to test developmental components, cores and servicing and operating methods, as well as to provide hands-on training for Navy nuclear plant operator trainees. The plants are a key Program resource. These plants are old with an average age over 22 years. To maintain these plants in a safe and reliable condition, a significant amount of effort is required. We are in the midst of a ten-year prototype servicing and refueling effort which involves all eight plants.

The remainder of the increase, approximately $20M, is due to escalation, Advanced Fleet Reactor work, which is proceeding well, facility decontamination work and fuel and beryllium shield changeout requirements for the Advanced Test Reactor located at the Idaho National Engineering Laboratory. Naval Reactors uses the Advanced Test Reactor for materials development work.

Question: Describe the need to nearly double your capital equipment requirements in FY 1987 and the impact of a delay in this effort.

Answer: The significant increase in capital equipment requirements is due to the replacement of the Knolls Atomic Power Laboratory's three CDC 7600 Computers. These machines represent half of the laboratories computing capabilities; they are old, having an average age of 15 years, and considered obsolete. Maintenance and repair support for this equipment is increasingly difficult to obtain making continued reliance on these computers unwise. By the time a replacement computer is installed and programs transferred the existing computers will be 18 years old.

The CDC 7600 Computers are an essential tool for reactor core design and reactor safety analysis. The Bettis and Knolls laboratories carry out continuing safety analyses of all operating naval nuclear reactors. The conduct of these analyses is heavily dependent on the laboratories' computer resources.

A delay of this acquisition will extend the period of dependence on these old computers, thus increasing the possibility of failure which would affect program work and the ability to assure safe operation of nuclear powered ships, including support of the POSEIDON and TRIDENT strategic deterrence. Specifically, reduced computing capability will delay TRIDENT and LOS ANGELES Class submarines and nuclear cruiser reactor safety analysis; design and analysis of the Advanced Fleet Reactor core; and verification of the overall SSN-21 plant design.

Question: What is the long-range forecast for increased capital equipment funding?

Answer: I expect my future requirements will be about the same as FY 87 due to a continuing need to replace and upgrade computer equipment and prototype plant components.

Question: Please describe the need for the increase in General Plant Project funding.

Answer: Naval Reactors General Plant Project funding requirements increase by $800,000 in FY87. The increase is due to safeguards and security upgrades necessary to meet the DOE-wide push for improved security. The construction of prototype plant servicing facilities and test facilities constitute most of the remaining work in FY87.

Question: Please describe the requirement for increased uranium enrichment included in the special nuclear materials budget.

Answer: Increased uranium enrichment is needed to support Naval fuel fabrication at both Nuclear Fuel Services (NFS) and at the Savannah River Plant Fuel Materials Facility. NFS has a contract to fabricate fuel at full production for about two more years. Savannah River will reach full production in FY1987 and will be operated at capacity to qualify the facility and to build needed inventory to cover possible increases in the shipbuilding program, shutdown, or other problems.

Reactor Plant Disposal

Question: What is the status of Navy plans to dispose of reactor plants from decommissioned nuclear powered ship?

Answer: The Navy prepared an Environmental Impact Statement which evaluated the impact of disposing decommissioned, defueled submarine reactor plants. On December 6, 1984, the Secretary of the Navy issued a Record of Decision in which he decided to dispose of defueled reactor plants by land burial at Department of Energy sites. In April 1986, the Navy disposed of the defueled reactor plant from the decommissioned submarine ex-PATRICK HENRY at the DOE Hanford Site.

Question: Is the plan for sea disposal — as opposed to land disposal still a live option? What are the relative costs of the two options?

Answer: Based upon the analysis in the Environmental Impact Statement, the Navy considers that permanent disposal would be environmentally safe and feasible using either the land burial or ocean disposal options. In his Record of Decision, the Secretary of the Navy chose land burial. The Record of Decision discusses the reasons for this decision. These included Congressional action in December 1982 restricting the issuance of ocean disposal permits and requiring Congressional approval before any such permit could be issued, statements by the Environmental Protection Agency that additional regulations may be required before a permit request could be evaluated, and the fact that land burial is the method currently used in the United States for disposal of other low level radioactive waste.

The cost to dispose of the ex-PATRICK HENRY reactor plant at the Hanford Site was approximately $7 million, including about $1.5 million in one time costs that will not be necessary for future disposals. Ocean disposal was estimated in the Environmental Impact Statement to cost approximately $2 million per submarine less than land burial. However, uncertainties in the costs to qualify and gain acceptance of an ocean disposal site and to obtain the necessary permits and approvals could narrow the cost differential between the two options.

Question: What is the status of choosing land sites for disposal? How will land disposal be accomplished?

Answer: The Navy Environmental Impact Statement evaluated land burial at both the DOE Savannah River Site in South Carolina and the DOE Hanford Site in Washington State, and concluded that there would be no significant adverse environmental impact at either site. In his Record of Decision, the Secretary of the Navy stated that with all but one of the decommissioned nuclear submarines currently in storage on the West Coast, the Hanford site is appropriate for use in the near future.

The defueled reactor plant from the ex-PATRICK HENRY was disposed of by the methods described in the Environmental Impact Statement. The reactor compartment was removed from the submarine, sealed, and secured to a barge at the Puget Sound Naval Shipyard. The barge was towed up the Columbia River to a barge slip adjacent to the DOE Hanford site. The reactor compartment was then moved by overland transporter to the burial area on the Hanford site.

Question: What is the schedule and site for disposal of the ten decommissioned submarines on the West Coast?

Answer: The reactor plant of the ex-PATRICK HENRY has already been moved to its burial place at the DOE Hanford Site. The Navy intends to proceed with disposal of the defueled reactor plants from other decommissioned submarines in the same manner. The schedule for these additional disposals is dependent upon the availability of funding and other shipyard work.

Water Cooled Breeder Program

Question: How much funding is needed to complete work on this reactor?

Answer: The FY 1987 funding request of $13.8 million will allow completion of the Water Cooled Breeder Program.

Question: What is needed in FY 87 to complete documentation and data collection/evaluation in FY 1987?

Answer: Work planned under the Core Evaluation portion ($10.2 million) of the Water Cooled Breeder budget request encompasses full documentation of the light water breeder concept and performance.

In effect, the core evaluation is the "frosting on the cake" to validate this 20-year effort which gives every indication of being highly successful. Assuming the evaluation work confirms core performance, technology will have been tested, proven, and documented which can use thorium, an abundant material in the U. S., as an energy source if the need arises.

The remainder of the funds are for clean-up work, fuel handling, shipment of the spent fuel to the Idaho Chemical Processing Plant, and to complete some minor remaining documentation of the defueling process and end-of-life core tests.

Question: Under your budget proposal are any activities planned for FY 88 and beyond?

Answer: No civilian nuclear energy work is planned by Naval Reactors following completion of the Water Cooled Breeder effort at the end of FY 1987.

Atomic Energy Defense Activities

STATEMENT OF SYLVESTER J. FOLEY, JR., ASSISTANT SECRETARY OF ENERGY FOR DEFENSE PROGRAMS

ACCOMPANIED BY:

BRIG. GEN. SIDNEY DAVIS, U.S. ARMY, ACTING ASSISTANT TO THE SECRETARY FOR DEFENSE (ATOMIC ENERGY)

LT. GEN. JAMES A. ABRAHAMSON, U.S. AIR FORCE, DIRECTOR, STRATEGIC DEFENSE INITIATIVE ORGANIZATION

Chairman Hatfield. We will invite the panel now to come to the table. Again, Admiral Foley, Assistant Secretary of Energy for Defense Programs, Brigadier General Davis, and Lt. Gen. Abrahamson.

Gentlemen, we have your written statements and they will be placed in the record. You may proceed as you wish.

FISCAL YEAR 1987 BUDGET REQUEST

Mr. Foley. Thank you, sir.

First of all, I am very pleased to be here. It is my first appearance before you. I have only been in the job a little over 4 months now. The defense appropriations request that we have before you, of about $8.2 billion, includes $600 million for Admiral McKee as he covered in his testimony to you.

I am responsible to Secretary Herrington and the Department of Energy for nuclear weapons research, design and testing, weapons production for nuclear materials, nuclear defense waste, and security and safeguards.

I thought I would address a few viewgraphs here, talk to those, give you my impression and feelings about things as I have seen them in these 4 months in the job, and then respond to any questions that you may have.

DEFENSE PROGRAMS MISSION
FY 87 APPROPRIATIONS REQUEST

- SUPPORT STOCKPILE MEMORANDUM
- SUPPORT PRESIDENT'S SDI PROGRAM
- ASSURE AVAILABILITY OF NUC MATERIALS
  - —NEAR TERM
  - —LONG TERM
- CONTINUE VIGOROUS AND BALANCED RD&T PROGRAM

DEFENSE PROGRAM PRIORITIES

Mr. FOLEY. Fundamentally, the budget request we have asked for is prioritized first in support of the President's stockpile memorandum. Our No. 1 research and development program within the Department of Energy is to support the SDI Program.

We have to ensure the availability of the nuclear materials, not just for the near term but also the longer term, so that we can meet whatever requirements that come up in that timeframe. We have a very vigorous R&D program, and in this particular case we have all the laboratory directors lined up in agreement that we just cannot reduce our technical base or our R&D program any further now.

We have taken money from that for other things in the past and it just can't go down any further.

DEFENSE PROGRAMS MISSION FY 87 APPROPRIATIONS REQUEST (Continued)

- CONTINUE SAFE MANAGEMENT OF RADIOACTIVE WASTE
- ACCOMMODATE REQUIREMENTS ASSOCIATED WITH SAFEGUARDS AND SECURITY
- COMPLY WITH ES&H LAWS AND REGS
- RESTORE, REVITALIZE, AND MAINTAIN DOE FACILITIES

Mr. FOLEY. The safe management of radioactive waste is a growing concern to us, not only the high-level but the transuranic and low-level waste. We are getting environmental pressures, of course, across the country and we are committed to effectively managing them.

Secretary Herrington has established a new position of assistant secretary for environment, safety, and health. He is committed to getting our arms around these environmental problems and cleaning up some of the problems of the past.

In the security and safeguards area, we have to be sure, even more so now in this time of terrorism, that what we have out there is safe, it is secure, and that the guard force we have is, in fact, trained professionals up to stringent standards which could meet any challenge that might come along.

I mentioned the environmental, safety, and health laws and regulations. When we first started out in this business years and years ago, there weren't many laws and regulations. There are now. It is an escalating curve. We are committed to meeting all the requirements of RCRA, CERCLA, the State requirements—all of these as we go along.

Restore, revitalize, and maintain the DOE facilities—I must tell you here that in the 4 months that I have been in the job, I have had a chance to get around to most of the facilities and I have gotten to the three principal DOE laboratories. I come away with the impression that this entire production complex is very fragile. It is old. There is very little redundancy. There aren't many work-around alternatives. It is technology of a past year. The most recent production facility we have was built in the 1950's. Money has got to be put into these facilities to make them more robust.

I must admit I was startled when I visited them and came away with that impression. I thought we had a much more vibrant program than we do.

Back in about 1980, money started going into revitalization and restoration and we have to keep doing that, because none of this can be waived.

FY 1987 BUDGET REQUEST

[Dollars in millions]

	FY 1986		FY 1987	
PROGRAM COMPONENT	APPROP.	ADJUST. APPROP.	AUTH.	APPROP.
TOTAL/WPNS ACTIVITIES	$4333	$4111	$4566	$4664
MATERIALS PRODUCTION	1863	1768	2048	2066
DEF WASTE/BYPROD MGT	656	619	689	704
VERIFICATION & CONTROL	97	94	102	102
NUCLEAR S&S	59	57	66	67
SECURITY INVESTIGATIONS	33	32	33	33
PRIOR YEAR ADJUSTMENTS		7		
GRAND TOTAL/DP	$7041	$6688	$7504	$7636

DETAIL OF BUDGET REQUEST

Mr. Foley. Now how do we aggregate this $7.6 billion request—$4.6 billion is for our total weapons activities. You will notice that there is a growth in it from 1986 to 1987, most of which is in SDI.

We have General Abrahamson here who can respond to the specific questions on SDI. I asked him to come on over because of our commitment to the milestones that he has, requirements that he has, and the necessity to get on with that sort of research and development.

Materials production, there is an increase in here. This is to meet the stockpile memorandum requirements.

Defense waste and byproducts, there is $700 million going into that. That is a lot of money. It is very necessary. I regard this as part of our environmental program, also. When we take $700 million here and a cross-cut of all the environmental programs that we have, it is about $500 million. We are talking over $1 billion now, about $1.2 billion across the board that is going into environmental aspects of our program.

Verification and control, about $100 million. Could they use a little bit more here? Probably. But any time you ask a lab director if he could use some more money, the answer is going to be, "Yes," he could use some more money. But in order of priorities and a careful look at it, it looks like about $100 million, in our judgment, the appropriate level.

Security and safeguards, a minor increase for the physical installation and the upgrading across the board of all of our Government facilities.

I must tell you that I find them equal to, or in some cases better, than those that I have seen in various ammunition depots while I was in the military.

Security investigations, about the same amount of money. We have cleaned up much of the backlog we had in security investigations. We are getting on with that. We should have fewer to do in the future. Part of that reason is because we drew down some of the total number of people that we have.

DEFENSE PROGRAMS
FY 87 APPROPRIATIONS REQUEST

IMPACT OF GRAMM-RUDMAN-HOLLINGS:

- ADJUSTED WPNS PRODUCTION SCHEDULES
- REDUCED PRODUCTION SUPPORT AND CONSTRUCTION ACTIVITIES
- REDUCED WPNS R&D TECHNOLOGY BASE AND DEVELOPMENT PROGRAMS
- ADJUSTED NUCLEAR MATERIALS PRODUCTION
- DELAYED WASTE TREATMENT AND TRANSFER FACILITIES
- MINIMIZED IMPACT ON SAFEGUARDS AND SECURITY AND ENVIRONMENTAL PROGRAMS

IMPACT OF GRAMM-RUDMAN REDUCTIONS

Mr. FOLEY. As we move into 1987, we, of course, had to consider the impact of Gramm-Rudman. What does that do to us? Well, it took about $350 million out of our fiscal year 1986 appropriation. We are well along in the fiscal year 1986 program. The initial request that we made was cut $400 million by Congress, plus the $350 million results in an overall reduction of about 10 percent. That is a pretty tough reduction in what we considered to be a lean budget.

We adjusted the weapons production schedules, not willy-nilly, but together with the Department of Defense we sat down and said, "Can we make any adjustments here?" The answer is, "Yes." There were some adjustments made so that our requirements were a little bit lower.

So within weapons production, we laid off probably about 1,000 people overall. About 2,000 went away, but some of that was retirement. We didn't hire some people, but we laid off a little better than 1,000 people.

All of this production support and construction is where we reduced the technology base, and this is where the laboratory directors are screaming bloody murder. They say you just can't reduce that tech base any further. It is very difficult here to finitely say, "This is SDI. This is inertial fusion. This is tech base research for other things." They overlap. They contribute to each other.

Fundamentally, the development of the physics principals just can't be reduced any more.

We delayed the waste treatment and transfer facilities, in some cases moved out a little bit slower to minimize the impact on it here because this is important. We are committed to it and we just can't walk in and say, "Well, I am not going to worry about security or the environment."

Some of these are show stoppers, if you will. The States will close us down if we don't do some of these environmental things.

DEFENSE PROGRAMS
FY 87 APPROPRIATIONS REQUEST

IN CONCLUSION:

- STRONG CHALLENGE TO MANAGE NUCLEAR WEAPONS COMPLEX
  - —GRAMM-RUDMAN-HOLLINGS
  - —IMPROVED COORDINATION AND STRATEGIC PLANNING WITH DOD
  - —ENHANCED SAFEGUARDS AND SECURITY
  - —ENVIRONMENTAL COMPLIANCE
- STRONG NATIONAL DETERRENT POSTURE MUST BE MAINTAINED

DEFENSE PROGRAM MANAGEMENT STRATEGY

Mr. FOLEY. So, in conclusion then, sirs, just a brief summary. It is going to be a severe challenge to manage the nuclear weapons complex. Gramm-Rudman came along after I did and that complicated the problem.

I say without any question at all, that we have improved coordination and planning with DOD. That isn't happenstance. We are making a concerted effort to get on with the blue ribbon task force's recommendations here.

We have institutionalized meetings with our lab directors and our field managers. We brought them all in and said, "If there was ever a day, for example, when someone showed up once a year with a basketful of money and said that I will be back next year, those days are long gone."

We have to do a better job of our strategic planning. We have to be able to lay out the impact, the different cuts, and changes in our program as we go along. We haven't done that very well in the Department of Defense programs, in particular, and we are going to do that better. We have that all laid out.

In the area of enhanced safeguards and security, I have an evaluation team that goes out and reports directly to me, nobody else. I send them on out for a couple of weeks at each one of our installations in accordance with a schedule. One of the things we do is we run a force-on-force. We evaluate them. We pulse the system and see whether or not we could break in and get some nuclear material or simulate a weapon and get it on out of there.

We find that it is getting tougher and tougher for our evaluation teams to have any success unless, in some cases, they make use of a simulated insider or a couple of them, or go to some degree where you presume you have cooperation of some number of people from the inside. Even that is becoming more difficult. So anyone who tried to break in and get anything has a very high likelihood of failure without any question.

Environmental compliance is upon us whether we like it or not. The Secretary is committed to it. I am committed to it. We have made mistakes along the line. We are smarter now than we were 40 years ago. The environmental requirements are much higher now than they were in years gone by and we have to live with that.

We are committed to it. Secretary Herrington is. As I say, he has appointed a new assistant secretary to go out to survey, get a prioritized order on how we are going to do all these different things, and now we have to get on with it.

Strong national deterrent posture must be maintained. We all agree with that. There isn't any question about that.

That concludes my presentation. I would be happy to respond to any questions you may have.

Chairman HATFIELD. Thank you, Admiral Foley. I think we will proceed to complete the panel and then we will pose the questions.

[The statement follows:]

STATEMENT OF SYLVESTER R. FOLEY, JR.

Mr. Chairman and Members of the Committee, I am pleased to make my first appearance before you in support of the FY 1987 Department of Energy's Atomic Energy Defense Activities Appropriations request of $8.2 billion. This request includes about $600 million for the Naval Reactor Program which Admiral Mckee will discuss. As the Assistant Secretary for Defense Programs, I am responsible to Secretary Herrington for the Department's nuclear weapons research, development and testing, weapons production, nuclear materials, defense waste management and safeguards and security programs. I would like to share my personal views and discuss the severe challenges we face to effectively plan and execute our critical National Security Program. The Department's funding request for FY 1987 reflects this Administration's commitment to a strong national defense capability while recognizing the need for fiscal restraint.

I will briefly describe the Defense Programs mission, the essential programs, and the thrust of our policies to achieve our goals. My programmatic Deputy Assistant Secretaries will be available to provide testimony or answer questions related to their specific plans supporting this effort.

It is our responsibility to provide and maintain this Nation's Nuclear Weapons Complex with sufficient capacity and capability to support national policy objectives and to assure a prudent level of flexibility in national security options. Nevertheless, I am committed to the long-term goals of this Administration to reduce and eventually eliminate nuclear weapons as instruments of war. In the near term we must maintain a strong national deterrent posture.

Congressional support over the years has been the key to successful execution of our responsibilities within Defense Programs. The Department of Energy and the Department of Defense jointly assess nuclear weapons requirements to assure essential new weapon deliveries are made within the necessary fiscal constraints of today's environment. Further we must accommodate other critical activities such as safeguards and security and environmental compliance within those same fiscal constraints. Our budget request for FY 1987 therefore specifically supports the following:

- Meet the weapons production requirements provided by the President's annual Nuclear Weapons Stockpile Memorandum.
- Continue to support the national Strategic Defense Initiative Program.
- Assure the continued availability of nuclear materials in the near- and long-term.
- Conduct a vigorous and balanced research, development, and testing program.
- Continue safe management of radioactive waste and make progress in implementing final disposal actions.
- Accommodate increasing requirements associated with safeguards and security and assure environmental and safety compliance are maintained.
- Continue to restore, revitalize, and maintain Department of Energy facilities to meet essential current and future requirements.

Our very best efforts are required to manage these programs as effectively and efficiently as possible. Sound business practices and the careful review of requirements to meet essential program needs are the primary objective of Defense Programs management. I stress the word "essential" because we must make tough choices among competing programs and each choice must be absolutely necessary.

In regard to the FY 1986 impact of the Gramm-Rudman-Hollings legislation, I personally share the Administration and the Congressional desire to control the budget deficit; however, this legislation will have a significant but manageable impact on our priority program activities. We are working closely with the Department of Defense and the National Security Council to adjust our production and research, development and technology programs to achieve a balance with requirements for new weapons development and deployment of new systems. In spite of our best efforts the reduction of $352 million will impact some key production and research efforts.

Because of the reductions in FY 1986, we must adjust our plans in order to mitigate impacts in FY 1987 and beyond. Our Defense Programs priorities reflect the primacy given to overall national security objectives related to meeting the needs reflected in the Stockpile Memorandum and to research in support of the Strategic Defense Initiative. We need to continue to maintain a strong research and development technical base to support the future while continuing to revitalize our research and development facilities. It is also vitally important to maintain and modernize our production plants to operate effectively and efficiently, as we ensure production capacity necessary to meet operational schedules. Finally, we must continue to make progress to assure facilities and materials are secure and safe from potential adversary actions and that environment and safety concerns are quickly detected and corrected responsibly and cost effectively.

Defense Programs is requesting an Appropriations of $7.6 billion which will allow growth of about 10 percent after adjusting for inflation and Gramm-Rudman-Hollings. In the research, development, and testing program, the increase is primarily attributed to research to support the Strategic Defense Initiative, which focuses on nuclear driven directed energy weapons concepts. Inertial fusion weapons activities will also be integrated into the technology base. Increases in weapons production/workload are associated with eight different types of nuclear warheads and bombs for the Department of Defense and to maintain weapons currently in the stockpile. These increases also provide for underground nuclear tests, an essential part of our research, development, and engineering program. Testing is needed to evaluate and maintain confidence in the functional reliability of the Nation's current nuclear stockpile and to develop and certify modern nuclear weapons to assure a viable deterrent for the future. It is also needed to explore promising new defensive concepts associated with the Strategic Defense Initiative and to maintain the technology base and expertise of weapon scientists to deal with possible future stockpile problems. Just as testing is important to maintaining confidence in the realiability of our nuclear stockpile, verification is a critical element in developing and maintaining confidence in any testing limitation treaty. DOE has been investigating and continues to investigate modern verification techniques. These techniques furnish the capability to deal effectively with future requirements, improvements in Threshold Test Ban verification, small yield detection and identification, and evaluation of seismic decoupling. Our FY 1987 request will provide adequate nuclear materials for the production of weapons during the directive years of the Nuclear Weapons Stockpile Memorandum as well as supporting security and environmental improvements essential to continue our operations. Increases are also necessary in our Defense Waste Programs as we prepare to transition from a storage mode of operations to preparation of waste for final disposal. Finally, the FY 1987 request continues to reflect the increases necessary to comply with environmental legislation such as the Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation and Liability Act.

In the relatively short time since the President asked me to take this position and my even shorter tenure as Assistant Secretary, I have become convinced that we in Defense Programs must make some changes in the way we do business. We must get ahead of the game rather than be reactive. In the few months I have been here I have studied the FY 1987 budget process and participated in the efforts to absorb reductions mandated by the Gramm-Rudman-Hollings Act. These specific efforts have convinced me of the need to implement a strong strategic planning capability within Defense Programs. We must develop and achieve consensus on our long-range plans and goals. This strengthened planning process, coordinated with the Department of Defense, is the only way we can face the imperatives of fiscal constraints and budget reductions, and still make the decisions which cover both the short-range and long-range needs.

These changes are consistent with the findings and recommendations of the President's Blue Ribbon Task Group on Nuclear Weapons Program Management. We have been moving aggressively to implement those recommendations contained in the Task Group's report that offer significant enhancement of the Department's management of the nuclear weapons program. Particular emphasis has been placed upon enhancing our internal cost management procedures and systems, strengthening the quality and scope of external cost reporting, and improving the interface with the Department of Defense. Most aspects are well underway with complete implementation expected during the FY 1988 budget cycle.

I have also recently completed some changes in organization and personnel within Defense Programs that supports this redirection in emphasis and priorities (Chart 2). Let me take a moment to briefly describe the Defense Programs organization and the people responsible, some of whom will be providing testimony to you later.

Major General Ken Withers will continue as Deputy Assistant Secretary for Military Application, with responsibility for weapons research, development, and production including the Inertial Confinement Fusion and Stategic Defense Initiative research. Mr. John Meinhardt is the Acting Deputy Assistant Secretary for Nuclear Materials, with responsibility for Nuclear Materials Production and Defense Waste and Transportation Management.
Mr. Ed Badolato is the Deputy Assistant Secretary for Security Affairs with responsibility for the safeguards and security at our DOE facilities.
Mr. Charles Boykin will continue to have responsibility for foreign intelligence and threat assessment as Deputy Assistant Secretary for Intelligence, and Dr. Julio Torres assumes the duties as Acting Director for the Office of Security Evaluations. The outyear planning process has been strengthened by adding the planning function to the resource function under the newly established Office of Plans and Resource Management.

Mr. James Culpepper is the Acting Director of this office. Special emphasis placed on integration of planning, programming, and budgeting will bring our management practices closer to those of the Department of Defense as recommended by the Blue Ribbon Task Group.

In conclusion, the Appropriations request of $7.6 billion before you today recognizes the strong challenge of managing the nuclear weapons complex within the fiscal constraints mandated by Congress and the President. I urge the Committee's approval of our budget request so we may work toward these objectives in the coming year. I look forward to working with you and your staff and I will keep the Committee fully and currently informed of our progress. I will be pleased to answer any questions you may have.

STATEMENT OF BRIG. GEN. SIDNEY DAVIS, U.S. ARMY, ACTING ASSISTANT TO THE SECRETARY OF DEFENSE (ATOMIC ENERGY)

Chairman HATFIELD. General Davis, I believe you are next.

General DAVIS. Thank you,sir. It is a pleasure to be here this afternoon. I think when one leaves this conference room with this eyeball-to-eyeball contact, you can certainly say you appeared before Congress. [Laughter.]

Chairman HATFIELD. This is your first trip up to this committee, too, is it?

General DAVIS. Yes, sir; it is. I would like to say that I have sat in the back for a couple of years and it was much more comfortable back there. [Laughter.]

I have two members of the Military Liaison Committee here, sir, as backup—Major General Molinelli and Brigadier General May. We were supposed to have an admiral here, sir, but we already used up our quota this afternoon. [Laughter.]

I have a few slides that I would like to show you, sir, to show the DOD flavor.

WEAPON PRODUCTION

- FY 86 G-R-H CUTS HAVE INCREASED RISK SUBSTANTIALLY
  - —NO SLACK BETWEEN DOE PRODUCTION AND DoD DEPLOYMENT SCHEDULES
  - —WE HAVE "USED UP" OUR LOWER PRIORITY PROGRAMS
  - —PRODUCTION BASE RISK TO QUALITY/RELIABILITY OF WEAPONS
- FULL SUPPORT OF FY 87 REQUEST ESSENTIAL

IMPACT OF GRAMM-RUDMAN-HOLLINGS REDUCTIONS

General DAVIS. Certainly the Gramm-Rudman-Hollings cuts had an impact on the production cycle. I think we suffered about a [deleted] percent reduction and it is going to take about 10 years to make that up.

We kind of salami sliced it. We matched up our systems builds with our warhead builds and we matched up our deployment schedules with our warhead builds also. But it is going to take a number of years to make it up. Certainly, the fiscal year 1987 budget is the start of that, so we fully support the 1987 request.

- DoD BUDGET REQUEST AIMS TOWARD REDUCED DEPENDENCE ON NUCLEAR WEAPONS
- IF DoD REQUEST NOT FULLY SUPPORTED, THERE WILL BE INCREASED DEPENDENCE ON NUCLEAR WEAPONS
- THEREFORE, DOE/DP REQUEST MUST BE FULLY SUPPORTED IN ANY CASE

General DAVIS. This one, sir, is kind of like preaching to the choir.

On one hand, we are saying, "Hey, don't cut the DOD budget." On the other hand we are saying, "If you do cut it, don't be proportional about it. Don't cut DOD a certain percentage and the DOE a certain percentage," because the DOD budget is configured to lessen the reliance on nuclear weapons. When you cut that, you shift the balance so that there is more reliance on nuclear weapons.

Actually, we should be saying, "If you cut the DOD budget, perhaps you ought to be increasing the DOE budget," but we are not saying that. We will be happy if you matched the fiscal year 1987 budget here.

Mr. FOLEY. It is alright with me if you want to say that. [Laughter.]

Chairman HATFIELD. You are in step with everyone else, General.

PLUTONIUM AND TRITIUM PRODUCTION FACILITIES

LONG TERM SUPPLY OF PLUTONIUM, TRITIUM IS EXTREMELY FRAGILE

- AGING FACILITIES, POLITICALLY VULNERABLE

LEAD-TIMES TOO LONG TO USE CERTAIN REQUIREMENTS OR CERTAIN FAILURE FOR PLANNING

- CONTINGENCY PLANNING IS KEY
- SOVIET CAPABILITY IS LARGE, NEW

MUST START NOW TO PROVIDE FOR RELIABLE, FLEXIBLE CAPABILITY IN 1990s

ISOTOPE SEPARATION IS THE ONLY APPROACH WITH ADEQUATE

- OUTPUT
- FLEXIBILITY
- ON-LINE DATE (1992)

MATERIAL PRODUCTION REQUIREMENTS

General DAVIS. Sir, I think you have seen this chart before and I would just like to give you the bottom line. I think DOE is doing a tremendous job in tying together our special nuclear material complex.

If we suddenly wake up one day and we need a new facility, it is going to take 10 to 15 years to build it and it is going to cost $6 to $8 billion.

We are concerned about contingencies. If the Soviets should suddenly break out, what do we do? If we should suddenly have a major breakdown in the complex, what do we do?

As we see it, the isotope separation facility is the only thing on the horizon that can do us any good. Just as an aside, I think it is like the Navy says: The Navy studies things while the Soviets build. I think we have been studying this one for a long time and the Soviets, in the meantime, have increased their capability tremendously.

Senator JOHNSTON. You say tritium is fragile. Can you predict precisely when it will lose its punch?

General DAVIS. That is predictable, sir. I think it is [deleted.] I am not a scientist, sir, but I know that is predictable.

Senator JOHNSTON. You will know exactly? You don't have to test to determine when it is has its punch or when it is losing its punch or do you?

General DAVIS. No, sir; we have a schedule, what we call a tradeout program, that after [deleted] we trade out the bottles with the tritium in them. So we know that. We can predict that.

NECESSITY FOR TESTING NUCLEAR WEAPONS

Senator JOHNSTON. I have heard it said that we need to have nuclear tests for, first, reliability, and second, safety. I can see a lot of reasons to test, but those two reasons didn't seem appropriate to me because of reliability; you ought to be able to predict exactly where that curve is on a given bottle of tritium so you know when it loses its punch.

Second, it is not a question of safety in the sense it might blow up if you don't test it, is it?

General DAVIS. Sir, we are concerned about our confidence in the reliability of the stockpile. While we can predict how long the tritium will last, we don't know what is going to happen to the rest of the system. Tritium is only a minor part of what is in there.

You also have plutonium in there, and in some of them you have uranium as well as many other reactive materials.

So we are saying that while we know the general lifetime of tritium and we can replace it, there are other things in there that are——

Senator JOHNSTON. Probably the conventional explosives are more important.

General DAVIS. That is part of the problem; yes, sir.

Senator JOHNSTON. Is safety a problem at all?

General DAVIS. No, sir; I don't think safety is a problem.

Senator JOHNSTON. No reason to test?

General DAVIS. No, sir; I would say for safety purposes, the weapons are reliable today.

Chairman HATFIELD. In fact, General, is not only one of your [deleted] proposed tests for reliability?

General DAVIS. I beg your pardon, sir.

Chairman HATFIELD. Isn't just one test out of the [deleted] scheduled for 1987, primarily a test for reliability?

General DAVIS. Sir, since 1980 I believe we have had about [deleted] stockpile reliability tests, [deleted].

Chairman HATFIELD. Out of how many total tests?

General DAVIS. I think we average about [deleted] a year, sir.

Mr. FOLEY. Mr. Chairman, if I may amplify on that. I don't want to leave the impression that we don't have a requirement to test for safety of the overall weapons system, because we certainly do.

For example, as General Davis says, [deleted] tests out of the total year are specifically earmarked for stockpile testing.

Senator JOHNSTON. That is reliability though, isn't it?

Mr. FOLEY. Some of it is safety also, and one of the reasons that we have the high explosive on it, whether or not it works. We can't tell if these things are going to work in some cases until you put it all together and you——

Senator JOHNSTON. That is reliability again though. I am talking about safety. It might blow up prematurely in the stockpile.

[Chart deleted.]

Mr. FOLEY. These are the total number of tests that we have. That gives you a feel for the particular test, the physics experiments, SDI, and the rest. In terms of safety, there is absolutely a need because we keep fixing.

One of the concerns we have is our people. For example, in the submarines, as Admiral McKee talked about, when you are sitting alongside weapons you want to know that there isn't going to be any radioactivity on and you don't know what the effects of this thing might be.

You must do some nuclear tests in safety. Reliability, yes, but also safety.

Senator JOHNSTON. To explode the nuclear device for safety?

Mr. FOLEY. Yes, sir; do the fixes work.

Senator JOHNSTON. For reliability.

Mr. FOLEY. The use control devices are reliability, but it is also safety.

Senator JOHNSTON. The what control?

Mr. FOLEY. It is pretty difficult to separate the safety and reliability to know that it is going to be safe, but also that the devices that make it safe are reliable.

Senator JOHNSTON. Now the safety devices, you don't have to explode the weapon to test those, do you?

Mr. FOLEY. Not all of those; no, sir.

Senator JOHNSTON. Any of them?

Mr. FOLEY. I would have to take that question for the record and go back and check.

[The information follows:]

NUCLEAR WEAPONS SAFETY MEASURES

Certain nuclear weapon safety measures and devices do not require nuclear tests to verify their effectiveness. Generally, those which do not intrude into the nuclear system but are confined to the arming, fuzing, and firing systems do not require nuclear testing. However, certain other major safety measures intrude into the nuclear system and most definitely require nuclear tests. An example of this would be the use of insensitive high explosives in a weapon. Looking to future improvements, some concepts that combine enhanced safety and command and control features are buried in the nuclear system and would likely require nuclear tests.

Senator JOHNSTON. It is no big deal. Those who say you have to test safety, I think are wrong. There are all kinds of reasons to test—reliability, et cetera, but not safety.

General DAVIS. I will tell you one thing though, Senator, they won't get any safer if you don't test. The major improvements that we have made in the safety of those weapons over the years have required nuclear testing.

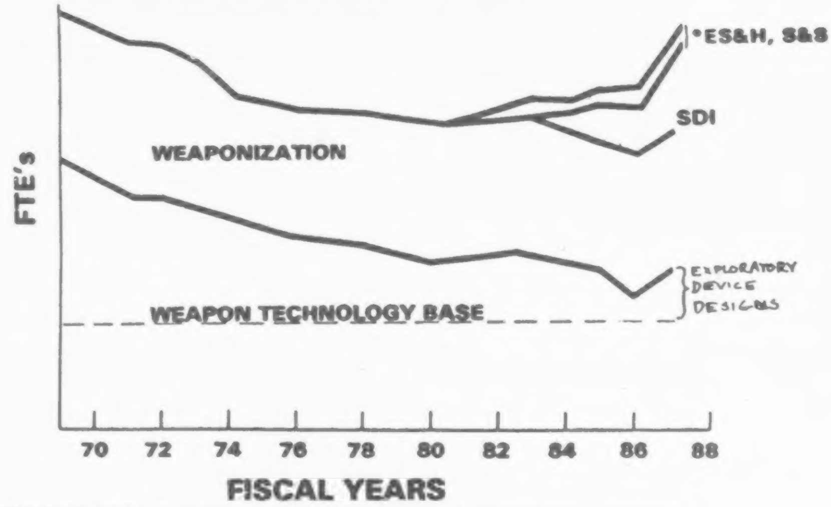
Chairman HATFIELD. Gentlemen, I don't want to debate on semantics, but I have some questions regarding the letter from Dr. Bradbury to the House Foreign Affairs Committee which relates to this question of necessity for testing for reliability.

I think we ought to spell out more clearly, either if we have to redefine our terms or if we have to expand upon past understanding, because there are some obvious difference of opinion expressed by some I would call experts on the necessity of testing for reliability along the line you are laying out today, or as I hear you, the interrelatedness between reliability and safety or the inexorable tie that exists.

So I will have some additional questions to further amplify on that for the record.

General DAVIS. Yes, sir; we will be happy to respond.

FY 69-87 WEAPONS RESEARCH AND DEVELOPMENT



*ESTIMATE OF ENVIRONMENTAL, SAFETY, AND HEALTH; SAFEGUARDS & SECURITY

LABORATORY MANPOWER LEVELS

General DAVIS. This is our full-time equivalent manpower at the weapons laboratories. Sir, since about 1969 through 1980 we had about a 40-percent decrease in FTE's. DOE has asked for a substantial increase in fiscal year 1987.

You can see that part of it goes for environment, safety and health, and safeguards and security, as well as SDI and weaponization. I guess part of our concern, is something called the weapon technology base.

In there you have the metallurgists, computer programmers, and so forth, and there is very little left for that small group of scientists that look out into the 1990's and the year 2000 for our exploratory device designs.

Senator JOHNSTON. Did you say exploratory device design?

General DAVIS. Yes, sir.

Senator JOHNSTON. What is that?

General DAVIS. That is the guy, sir, in layman's terms, which is all I know, who looks ahead and says, "Hey, what might we come up with in the year 2000 that would be more effective; smaller, safer, whatever?"

Chairman HATFIELD. Is that a third generation, though, that you are talking about?

General DAVIS. Yes, sir; partly.

BENEFITS OF TESTING

- STOCKPILE TODAY IS 1/3 SMALLER THAN IN 1967
- AGGREGATE EXPLOSIVE POWER IS 1/4 OF 1960 LEVEL—GREAT REDUCTION IN COLLATERAL DAMAGE
- NOT ONLY SMALLER—MORE SAFE—MORE SECURE
- DETERMINE NUCLEAR WEAPONS EFFECTS—BUILD EQUIPMENT TO SURVIVE
- MAINTENANCE OF A VIABLE R&D BASE
- SOLID DETERRENT—HIGH CONFIDENCE IN RELIABILITY OF STOCKPILE

BENEFITS OF TESTING NUCLEAR WEAPONS

General Davis. The biggest advantage we have, sir, is our brains and our ability to look ahead. We need that group out there looking ahead.

I might as well take this next one on head on. [Laughter.]

We read a lot in the paper about test bans, and I think the American public loses track of the benefits of testing. Since about 1967, the size of the stockpile has gone down from [deleted] warheads, down to about [deleted].

Just as important, the megatonnage has been reduced by 75 percent of the 1960 level. Sir, that is significant, because when you think of collateral damage and the damage that we could do to targets that we are not shooting at, it is rather significant.

We made them safer and smaller. We have insensitive high explosives. [Deleted.]

[Deleted.]

General Davis. It is important that we better understand the nuclear weapons effects so that we can build and modernize our equipment to survive on the nuclear battlefields.

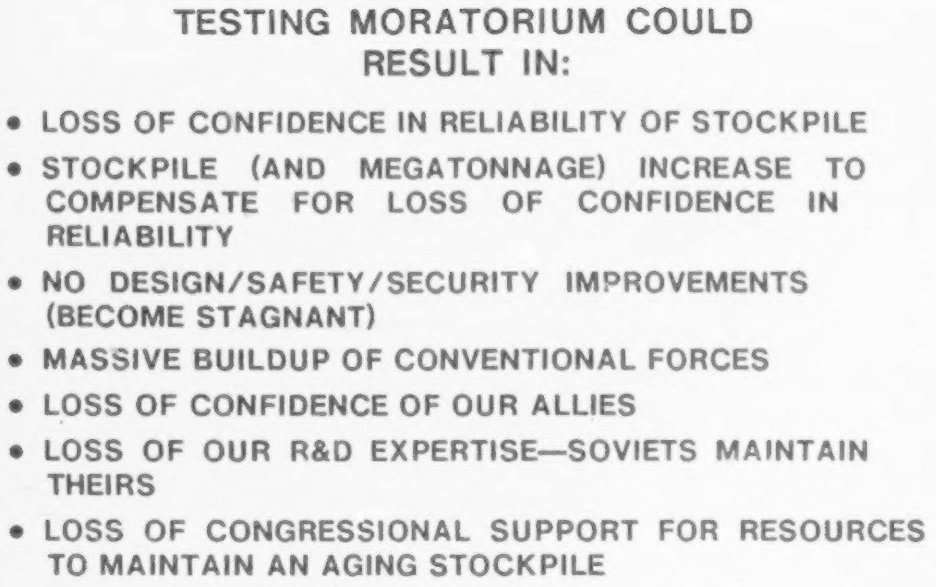
We have just a great bunch of scientists, sir, down there at the national labs and, like I said, I am not a scientist, but I recognize and appreciate talent. I have been working with them for a couple of years and they have my utmost respect and confidence.

We have a deterrent in which not only the United States has confidence, but also our allies.

Chairman Hatfield. General, I want to commend you on this qualitative analysis. We get so many quantitative comparisons made between we and they with red and blue bars that it is good to get a qualitative understanding of some of this comparison which does not always show up in the pure numbers game.

General Davis. I have one more chart, sir, if I may, or were you trying to cut me off? [Laughter.]

Chairman Hatfield. No; you must have been in a classroom, too, at one time.



TESTING MORATORIUM COULD RESULT IN:

- **LOSS OF CONFIDENCE IN RELIABILITY OF STOCKPILE**
- **STOCKPILE (AND MEGATONNAGE) INCREASE TO COMPENSATE FOR LOSS OF CONFIDENCE IN RELIABILITY**
- **NO DESIGN/SAFETY/SECURITY IMPROVEMENTS (BECOME STAGNANT)**
- **MASSIVE BUILDUP OF CONVENTIONAL FORCES**
- **LOSS OF CONFIDENCE OF OUR ALLIES**
- **LOSS OF OUR R&D EXPERTISE—SOVIETS MAINTAIN THEIRS**
- **LOSS OF CONGRESSIONAL SUPPORT FOR RESOURCES TO MAINTAIN AN AGING STOCKPILE**

IMPACT OF A TEST MORATORIUM

General DAVIS. Sir, I am very concerned about a test moratorium. We say we will lose confidence in the reliability of the stockpile.

Our stockpile is about 13 years old. It is like taking a 13-year-old Chevy, putting it in your garage, putting it up on blocks, and saying, "You know you can change the tires, you can keep it full of gas, check the oil, the spark plugs and everything else, and then 10 years from now, go out in that garage, turn the key, and see if it starts."

Sir, as a soldier, that bothers me. I don't know that it is going to work.

Chairman HATFIELD. If you take care of it along the way and give the new battery some juice and everything like that?

General DAVIS. Yes, sir; but you didn't let me start it over the years. You see, I don't know whether it is going to start or not.

Chairman HATFIELD. I had a great aunt who had a car like that and it started at the time I inherited it. Excuse me, I should have cut you off before this one. [Laughter.]

General DAVIS. There is a danger, sir. I mentioned the decrease in the megatonnage of the stockpile. Here again, as a soldier, if you tell me that it may not do what it is supposed to do 10 years from now, I may say, "Well, heck, I may have to shoot a bigger one or I may have to shoot two to get the job done."

Senator JOHNSTON. General, what percentage of your tests are with the nuclear-directed energy weapons and what percent from your regular weapons?

General DAVIS. Sir, I would like to let General Abrahamson handle that, with your permission. I have a breakout here.

[Chart deleted.]

General Abrahamson. Here it is by percentage. We tried to indicate the strategic defense, number of tests by the colors. You can see it is a minor amount but, nonetheless, it is significant.

General Davis. I guess my bottom line, sir, is that if you want to know how good the stockpile is, how reliable it is, what would happen to it if you went under a test moratorium, it seems to me you would go to our experts—the people that work with it every day and really feel confident in what it will do and what it won't do. That is the people in our national labs that our nuclear stockpiles have been entrusted to, the laboratory directors and the Department of Energy.

If you really want to know what is going on in the stockpile, they are the experts. They are the people we seek advice from, and I think we really need to rely more heavily on them, sir.

Chairman Hatfield. General, would a mutual test ban be acceptable under any conditions?

General Davis. If you do away with all the nuclear weapons in the world, as a soldier, I am going to look across the border there in Germany and I am going to say, "That is fine. Now we can take the Russians on one-on-one." I don't like that prospect because they have a heck of a lot more soldiers. They have a heck of a lot more tanks, a heck of a lot more guns. We can't do that.

We can't come under any kind of a test ban treaty in isolation. We have to consider the whole gamut of things. If they come down to our level in conventional forces, we might have a chance. We will never build up to their level, Senator, I don't think.

Chairman Hatfield. But we are not giving away anything.

General Davis. We are giving away the confidence we have in the reliability of our stockpile, sir, and that is what we are sacrificing.

Chairman Hatfield. Thank you, General.

General Davis. Thank you.

[The statement follows:]

STATEMENT OF BRIG. GEN. SIDNEY DAVIS

(U) MR. CHAIRMAN, MEMBERS OF THE COMMITTEE, AS THE ACTING ASSISTANT TO THE SECRETARY OF DEFENSE (ATOMIC ENERGY) FOLLOWING DR. WAGNER'S DEPARTURE, I APPRECIATE THE OPPORTUNITY TO APPEAR BEFORE YOU TO PROVIDE THE DEPARTMENT OF DEFENSE (DOD) VIEWS IN SUPPORT OF THE PRESIDENT'S BUDGET REQUEST FOR THE DEPARTMENT OF ENERGY (DOE) NUCLEAR WEAPONS PROGRAM FOR FY87. I AM ACCOMPANIED BY ONE MEMBER OF THE MILITARY LIAISON COMMITTEE FROM EACH OF THE MILITARY DEPARTMENTS IN ORDER TO RESPOND TO QUESTIONS CONCERNING THE SPECIFIC NUCLEAR WEAPONS REQUIREMENTS OF HIS SERVICE.

(U) WE HAVE ENTERED AN ERA IN WHICH FISCAL CONSTRAINTS HAVE NOT ALLOWED THE DEPARTMENT OF ENERGY TO SATISFY ALL OF THE THINGS NEEDED TO ENSURE OUR NATIONAL SECURITY. DIFFICULT DECISIONS ABOUT THE RELATIVE IMPORTANCE OF ESSENTIAL REQUIREMENTS HAVE BEEN MADE. IN ORDER TO ACCOMMODATE FY86 BUDGET REDUCTIONS RESULTING FROM THE "BALANCED BUDGET AND EMERGENCY DEFICIT CONTROL ACT OF 1985," IMPACTS HAVE BEEN FELT IN RESEARCH, DEVELOPMENT, AND TESTING, WEAPONS PRODUCTION, AND NUCLEAR MATERIAL PRODUCTION.

WITHIN RD&T, WE HAVE ATTEMPTED TO PROTECT WEAPONS IN DEVELOPMENT AND SDI, ALTHOUGH THE REDUCTIONS TAKEN IN SDI WILL CAUSE PROGRAM DELAYS WHICH WILL INCREASE THE DIFFICULTY OF MEETING SDIO MILESTONES; SUBSTANTIAL REDUCTIONS IN *DELETED*

DELETED

IN THE WEAPONS PRODUCTION AREA, *DELETED* AND MATCHED WARHEAD DELIVERIES EXACTLY WITH SCHEDULED MISSILE DELIVERIES, WITH NO SLACK, SO THAT ANY PERTURBATIONS IN WARHEAD DELIVERIES WILL DIRECTLY AFFECT OPERATIONAL CAPABILITIES. WE HAVE ACCEPTED THIS RISK BECAUSE IT IS PREFERABLE TO THE CERTAIN

ALTERNATIVE OF DELETED FURTHER, OUR EFFORTS TO ESTABLISH A RESILIANT LONG TERM SUPPLY OF SPECIAL NUCLEAR MATERIAL HAS BEEN DAMAGED BY THE LOSS OF APPROXIMATELY ONE-HALF YEAR OF ONE PRODUCTION REACTOR BECAUSE OF REDUCTIONS IN OPERATING FUNDS.

(U) THE CAPABILITY TO FIND THE LEAST DAMAGING COMPROMISES REQUIRED BY THESE CONSTRAINTS AND SHORTFALLS HAS BEEN ENHANCED BY THE EVEN CLOSER COOPERATION BETWEEN OUR TWO DEPARTMENTS. THIS COOPERATION IS CONSISTENT WITH THE RECOMMENDATIONS OF THE PRESIDENT'S BLUE RIBBON TASK GROUP CHARTERED TO EXAMINE THE PROCEDURES USED BY DOD AND DOE IN ESTABLISHING REQUIREMENTS FOR, AND PROVIDING RESOURCES FOR, THE RESEARCH, DEVELOPMENT, TESTING, PRODUCTION, SURVEILLANCE, AND RETIREMENT OF NUCLEAR WEAPONS, AND TO RECOMMEND ANY NEEDED CHANGE IN COORDINATION, BUDGETING, OR MANAGEMENT PROCEDURES. BECAUSE OF ITS RECOMMENDATION THAT OVERALL BUDGET PLANNING NEEDS CLOSER COOPERATION, PARTICIPATION BY THE DEPARTMENT OF ENERGY IN DOD'S PROGRAM, PLANNING, AND BUDGETING SYSTEM IS BEING PLANNED, AS WELL AS CLOSER DOD PARTICIPATION IN DOE BUDGET PLANNING. THESE CHANGES WILL SOON BE REFLECTED IN CHANGES IN HOW WE PLAN THE FY 1988 BUDGET. OUR APPROACH IS DESCRIBED IN A BROAD OUTLINE BELOW; DETAILS ARE BEING WORKED OUT NOW.

(U) RESPONSE TO THE REPORT OF THE PRESIDENT'S BLUE RIBBON TASK GROUP ON NUCLEAR WEAPONS PROGRAM MANAGEMENT

(U) IN THE SUMMER AND FALL OF 1984, THIS COMMITTEE ACTED TO FOCUS ATTENTION ON SEVERAL PERCEIVED PROBLEMS WITH MANAGEMENT OF THE NATION'S NUCLEAR WEAPONS PROGRAM. THE PERCEPTION WAS THAT DOD VIEWED NUCLEAR WEAPONS AS "FREE GOODS," WHICH CAUSED TOO MUCH RELIANCE ON NUCLEAR WEAPONS AND INSUFFICIENT ATTENTION AND EMPHASIS ON UPGRADING CONVENTIONAL FORCES. ALSO, BECAUSE NUCLEAR

WEAPONS ARE "FREE" TO DOD, WARHEAD DESIGNS ARE TOO ELABORATE, DRIVING UP COSTS OF DEVELOPMENT AND PRODUCTION.

(U) THERE WAS ALSO THE PERCEPTION THAT EVEN WHEN THE NUMBERS AND CHARACTERISTICS OF SPECIFIED NUCLEAR WEAPONS WERE APPROPRIATE, THERE WAS STILL POOR MANAGEMENT OF COSTS AND SCHEDULES: BY DOD, BECAUSE THE COST OF INEFFICIENCIES IS PAID BY DOE; AND BY DOE, BECAUSE REQUIREMENTS ARE CONTROLLED BY DOD.

(U) FINALLY, THE PERCEPTION WAS THAT NUCLEAR WEAPONS SIMPLY COST TOO MUCH, EVEN COMPARED WITH OTHER HIGH TECHNOLOGY WEAPONS.

(U) THE DEPARTMENT OF DEFENSE AUTHORIZATION ACT OF 1985 (PUBLIC LAW 98-525) INCLUDED SECTION 1632 WHICH CALLED ON THE PRESIDENT TO ESTABLISH A BLUE RIBBON TASK GROUP TO "EXAMINE THE PROCEDURES USED BY THE DEPARTMENTS OF DEFENSE AND ENERGY IN ESTABLISHING REQUIREMENTS AND PROVIDING RESOURCES FOR THE RESEARCH, DEVELOPMENT, TESTING, PRODUCTION, SURVEILLANCE, AND RETIREMENT OF NUCLEAR WEAPONS." THE TASK GROUP WAS ASKED TO RECOMMEND ANY NEEDED CHANGE IN COORDINATION, BUDGETING, OR MANAGEMENT PROCEDURES AND TO ADDRESS "WHETHER DOD SHOULD ASSUME THE RESPONSIBILITY FOR FUNDING CURRENT DOE WEAPON ACTIVITIES AND MATERIAL PRODUCTION PROGRAMS."

(U) THE TASK GROUP WAS ESTABLISHED BY EXECUTIVE ORDER 12499 OF JANUARY 18, 1985. THE HONORABLE WILLIAM CLARK WAS APPOINTED AS CHAIRMAN AND SIX MEMBERS INCLUDING JAMES SCHLESINGER (VICE CHAIRMAN), HAROLD AGNEW, ALAN FURTH, JEANNE KIRKPATRICK, FREDERICK KROESEN, AND WILLIAM PERRY WERE APPOINTED JOINTLY BY THE PRESIDENT AND CONGRESS. THE TASK GROUP CONDUCTED A COMPREHENSIVE REVIEW OF PROGRAM MANAGEMENT ARRANGEMENTS AND PROCEDURES WITHIN AND BETWEEN DOD AND DOE. THEY ALSO CONSIDERED OTHER MANAGEMENT INFLUENCES, SUCH AS OMB, NSC, AND THE CONGRESS. THEIR DELIBERATIONS LED TO A CONSENSUS REPORT IN JULY 1985 WHICH WAS PROVIDED TO THE PRESIDENT AND TO THE CHAIRMEN OF THE COMMITTEES ON ARMED SERVICES OF THE SENATE AND THE HOUSE OF REPRESENTATIVES. SIMULTANEOUSLY, THE TASK GROUP PROVIDED INFORMATION COPIES OF ITS REPORT TO BOTH THE DEPARTMENT OF DEFENSE AND THE DEPARTMENT OF ENERGY.

(U) SENIOR OFFICIALS OF BOTH DOD AND DOE HAD WORKED CLOSELY WITH THE TASK GROUP TO FACILITATE ITS REVIEW, AND STAFF MEMBERS FROM BOTH DEPARTMENTS HAD BEEN ASSIGNED FULL TIME TO SUPPORT THE TASK GROUP'S EFFORTS. BOTH DEPARTMENTS WERE, THEREFORE, FAMILIAR WITH THE THRUST OF THE TASK GROUP'S EFFORT AND COULD APPRECIATE THE TASK GROUP'S CHALLENGE IN ARRIVING AT A SET OF COHERENT RECOMMENDATIONS WHILE RECONCILING LEGITIMATE BUT COMPETING CONCERNS.

(U) HOW REAL OR SERIOUS DID THE BLUE RIBBON TASK GROUP FIND THE PERCEIVED PROBLEMS TO BE? DESPITE THE FACT THAT DOD DOES NOT DIRECTLY PAY FOR NUCLEAR WARHEADS, THE TASK GROUP FOUND THAT THERE WERE MITIGATING CONSIDERATIONS.

(U) IN GENERAL, THE DOD, WORKING CLOSELY WITH THE DOE, ESTABLISHES REQUIREMENTS FOR EACH WEAPON TYPE IN THE DEVELOPMENT PROCESS AND ANNUALLY IN FORMULATION OF THE NUCLEAR WEAPONS STOCKPILE MEMORANDUM. IN A BUDGET SENSE, THE TOP MANAGEMENT LEVELS OF OMB AND DOD ALSO VIEW THE NATIONAL SECURITY "050" ACCOUNT AS A UNIT, SO THAT DOD, DOE/DP, AND OTHER ELEMENTS DO COMPETE. ALSO, FOR NEW WEAPON REQUIREMENTS, STUDIES OF COST EFFECTIVENESS ARE DONE AND HAVE BEEN EMPHASIZED IN RECENT YEARS.

(U) ARE THERE TOO MANY NUCLEAR WEAPONS? STRATEGIC NUCLEAR WEAPON NEEDS ARE DRIVEN BY SYSTEM REQUIREMENTS, DEVELOPED IN RESPONSE TO THE PRESIDENT'S STRATEGIC FORCES MODERNIZATION PROGRAM. THE NEED FOR TACTICAL. NON-STRATEGIC WEAPONS IS DETERMINED AFTER REVIEWING THE CAPABILITY OF CONVENTIONAL SYSTEMS; BECAUSE MOST SUCH WEAPONS ARE NOT TIED DIRECTLY TO DELIVERY SYSTEMS, THE REQUIREMENTS ARE SCRUTINIZED EVEN MORE CAREFULLY. DOD DOES INCUR LARGE COSTS TO SUPPORT NUCLEAR FORCES, ABOUT 15% OF THE BUDGET. BOTH THE TYPES AND THE NUMBERS OF WEAPONS ARE EXTENSIVELY REVIEWED, RECEIVING MUCH MORE TOP MANAGEMENT ATTENTION.

(U) ARE THE DESIGNS TOO ELABORATE? EACH WEAPON TYPE MUST BE CONSIDERED IN VIEW OF THE MILITARY OPERATIONAL ROLES IT IS DESIGNED TO FULFILL. SPECIAL FEATURES ARE INCLUDED ONLY WHEN THEY PROVIDE A NEEDED CAPABILITY OR ALLOW EFFICIENCIES THROUGH SMALLER QUANTITIES AND OPERATIONAL FLEXIBILITY IN MULTIPLE ROLES. THE LABORATORIES DO SOMETIMES HELP TO IDENTIFY AND "STIMULATE" SUCH REQUIREMENTS.

(U) BUT, DO NUCLEAR WEAPONS SIMPLY COST TOO MUCH? COMPARED TO OTHER HIGH TECHNOLOGY DEFENSE PROGRAMS, WARHEAD UNIT COSTS APPEAR TO BE RISING AT ABOUT THE SAME RATE. OF COURSE MORE DISCIPLINE IS POSSIBLE, AND RECENT INITIATIVES ARE HELPING WITH THAT. HOWEVER, BECAUSE WE KNOW SO LITTLE ABOUT SOVIET NUCLEAR PROGRAMS, OUR PUSH IN TECHNOLOGY ADDS TO DETERRENCE AND IS WORTH THE INVESTMENT. THE TASK GROUP STRONGLY ENDORSED THE WORK OF THE LABORATORIES IN THIS REGARD.

(U) THE TASK GROUP CONCLUDED THAT FUNDING RESPONSIBILITY FOR DOE'S NUCLEAR WEAPON ACTIVITIES SHOULD NOT BE TRANSFERRED TO DOD--BECAUSE THE DISADVANTAGES OF SUCH A TRANSFER WOULD MORE THAN OFFSET THE ADVANTAGES. ON THIS, WE CONCUR FULLY WITH THE TASK GROUP. BUT HAVING REACHED THIS CONCLUSION, THE TASK GROUP RECOMMENDED A BROAD SET OF "FINE-TUNING" CHANGES IN MANAGEMENT

ARRANGEMENTS AND PROCEDURES AIMED TOWARD INTRODUCING MORE FISCAL DISCIPLINE WHILE AVOIDING THE RISKS ASSOCIATED WITH TRANSFERRING FUNDING RESPONSIBILITIES.

(U) BOTH DOD AND DOE HAVE COMPLETED INDEPENDENT AND JOINT ASSESSMENTS OF THESE TASK GROUP RECOMMENDATIONS. IN GENERAL, WE AGREE WITH THE TASK GROUP ASSESSMENT THAT IMPROVEMENT CAN BE MADE IN THE MANAGEMENT ARRANGEMENTS AND PROCEDURES WITHIN BOTH DOD AND DOE, AND IN THE WAY THE DEPARTMENTS WORTH TOGETHER. THE DETAILS OF SUCH IMPROVEMENTS ARE STILL BEING STAFFED BOTH INDEPENDENTLY AND JOINTLY BY DOD AND DOE. BUT WE CAN ALREADY SEE A CLOSER WORKING ARRANGEMENT EMERGING BETWEEN THE TWO DEPARTMENTS.

(U) NEW CLOSER WORKING ARRANGEMENTS WILL FACILITATE CONSIDERATION OF PROGRAM PRIORITIES AND ENCOURAGE GREATER FISCAL DISCIPLINE ACROSS THE DEPARTMENTAL BOUNDARIES. FOR EXAMPLE, THE DOE BUDGET REQUEST NOW BEFORE YOU FOR CONSIDERATION REFLECTS OUR FIRST STEPS TOWARD MODIFYING THE BUDGET PREPARATION PROCESS TO INCLUDE FISCALLY CONSTRAINED TRADEOFFS AMONG DOE REQUIREMENTS AND OTHER DEFENSE (DOD) NEEDS. BOTH DOD AND DOE WORKED CLOSELY WITH OMB TO STRUCTURE A RATIONALE PROGRAM BALANCE ACROSS DEPARTMENTAL LINES. ADJUSTMENTS BETWEEN DOD AND DOE WERE MADE LATE IN THE FY87 BUDGET REQUEST PREPARATION CYCLE, AND WE ARE WORKING TO DEFINE NEW ARRANGEMENTS AND PROCEDURES FOR USE MUCH EARLIER IN THE FY88 CYCLE. FOR EXAMPLE, WE HAVE AGREED TO CONSIDER THE INCREMENTAL COSTS OF DOE NUCLEAR WEAPONS PRODUCTION IN COMPETITION WITH OTHER DEFENSE (DOD) NEEDS IN A JOINT DOD/DOE REVIEW PROCESS.

(U) ARRANGEMENTS AND DETAILS ARE NOW BEING DEFINED TO ALLOW IMPLEMENTATION OF THIS JOINT PROCESS TO COINCIDE WITH OSD

REVIEW OF SERVICE PROGRAM OBJECTIVE MEMORANDA THIS SUMMER. ADJUSTMENTS ACROSS DEPARTMENTAL LINES, IN EITHER DIRECTION, WILL BE POSSIBLE AS WE JOINTLY PRIORITIZE COMPETING REQUIREMENTS IN A FISCALLY CONSTRAINED PROCESS. THIS WILL MORE CLOSELY INTEGRATE DOE'S PROCESS INTO DOD'S PROGRAMMING AND BUDGET FORMULATION MUCH LIKE THE TASK GROUP RECOMMENDED, BUT WITHOUT THE COMPLEXITY OF ARTIFICIAL BUDGET PLANNING CEILING MANIPULATION. WHERE ADJUSTMENTS BETWEEN DEPARTMENTS ARE NEEDED, DOD AND DOE CAN JOINTLY WORK WITH OMB, BEGINNING EARLY IN THE PROCESS AND CONTINUING THROUGH FINAL PREPARATION OF THE BUDGET REQUEST.

(U) JCS AND THE SERVICES, ALONG WITH OSD AND DOE, WILL BE MAJOR PARTICIPANTS IN THIS TRADEOFF AND RESOURCE ALLOCATION PROCESS, ASSURING THAT ALL DEFENSE NEEDS COMPETE EQUITABLY. THIS ALSO ADDRESSES ANOTHER TASK GROUP CONCERN, THAT MILITARY PRIORITIES BE FULLY CONSIDERED.

(U) A NEW GROUP, PROPOSED BY THE TASK GROUP, IS BEING CONSIDERED WHICH COULD FOCUS THE CONDUCT OF INTEGRATED REVIEWS OF NUCLEAR WEAPONS ISSUES AND BUDGETS AND COULD ASSURE APPROPRIATE CONSIDERATION OF TRADEOFFS WITHIN AND BETWEEN DEPARTMENTS. WE DO, HOWEVER, BELIEVE THAT THE MLC CONTINUES TO SERVE USEFUL FUNCTIONS BOTH WITHIN DOD AND BETWEEN DEPARTMENTS IN ITS LIAISON ROLE. THIS FORUM SHOULD BE PRESERVED AND STRENGTHENED, AND WE ARE WORKING TO IMPROVE THE ABILITY OF THE MLC TO DO ITS JOB.

(U) ARRANGEMENTS EXIST NOW FOR EFFECTIVE COORDINATION WITH DOE, BOTH FUNCTIONALLY AND THROUGH THE MLC, ON SUCH INDIVIDUAL SYSTEM MATTERS AS THE MILITARY CHARACTERISTICS (MCS) AND THE STOCKPILE-TO-TARGET-SEQUENCE (STS). DISCIPLINE IS ENHANCED BY FORMAL STATEMENTS OF REQUIREMENTS (MC/STS) BY DOD

AND FORMAL STATEMENT OF COSTS TO MEET THOSE BY DOE (I.E., PHASE 2A STUDIES AND ESTABLISHMENT OF BASELINE COST) AND, LATER, FORMAL ACCEPTANCE OF CERTIFICATION BEFORE PRODUCTION DECISION. THE MLC IS THE RIGHT DOD FORUM, WITH THE APPROPRIATE SERVICE MEMBERSHIP, TO EXERCISE INDIVIDUAL SYSTEM COST DISCIPLINE, FOR EXAMPLE, ON ISSUES REGARDING THE MILITARY NEED/BENEFIT OF SPECIAL FEATURES THAT CAN DRIVE UP THE UNIT COST OF NEW NUCLEAR WEAPONS.

(U) ADDITIONALLY, WE ARE EMPHASIZING PROCEDURES TO ASSURE THAT COST/PERFORMANCE TRADE-OFFS ARE ACCOMPLISHED DURING THE NUCLEAR WEAPON ACQUISITION PROCESS. THIS EMPHASIS BEGINS WITHIN EACH DEPARTMENT AND IS FOCUSED DURING THE JOINT MILITARY LIAISON COMMITTEE (MLC) REVIEW PROCESS. IN LINE WITH PARALLEL CHANGES THAT HAVE ALREADY BEEN IMPLEMENTED TO STRENGTHEN DOD'S BROADER ACQUISITION MANAGEMENT RESPONSIBILITIES, WE ARE STAFFING PROCESS CHANGES WHICH WILL ELEVATE MANAGEMENT ATTENTION ON NUCLEAR WEAPON ACQUISITION. FOR EXAMPLE, WE ARE STAFFING NEW DOD DIRECTIVES TO ELEVATE A MAJOR DOD/DOE PROGRAM MILESTONE DECISION POINT FROM THE CURRENT USDRE LEVEL. THE DEPUTY SECRETARY OF DEFENSE, AS THE DOD ACQUISITION EXECUTIVE, WILL ACT ON DECISIONS TO INITIATE ENGINEERING DEVELOPMENT (PHASE III REQUESTS) OF NUCLEAR WEAPONS. THIS RESPONDS TO THE TASK GROUP'S RECOMMENDATIONS. SIMILARLY, WE ARE WORKING WITH DOE TO EMPHASIZE COST DISCIPLINE, AGREE ON BASELINE COSTS, AND ENFORCE COST MONITORING AS THE TASK GROUP RECOMMENDED.

(U) FINALLY, AS WE TAKE EACH STEP IN RESPONSE TO RECOMMENDATIONS IN THE TASK GROUP'S REPORT, WE ARE ALSO TAKING GREAT CARE TO ASSURE PRESERVATION OF THE STRENGTHS AND CAPABILITIES OF THE PRESENT SYSTEM. WE MUST NOT AND WILL NOT

COMPROMISE ON CRITICAL AREAS SUCH AS NUCLEAR SAFETY, AND WE MUST ALSO ENCOURAGE, NOT INHIBIT, THE DOE'S INNOVATIVE AND AGGRESSIVE TECHNOLOGY BASE ACTIVITIES. THE INVESTMENTS WE MAKE TODAY IN THIS AREA ARE THE FOUNDATION FOR A STRONG DEFENSE POSTURE TOMORROW. WE ARE WORKING WITH DOE TO PROVIDE IMPROVED ARRANGEMENTS FOR DEFENSE-RELATED R&D AT THE NATIONAL LABORATORIES ON THE FULL SCOPE OF DEFENSE NEEDS WHERE THE UNIQUE CAPABILITIES OF LOS ALAMOS, LIVEMORE, AND SANDIA CAN MAKE MAJOR CONTRIBUTIONS. HOWEVER, THE LABORATORY PRIORITY ON NUCLEAR WEAPONS RESEARCH HAS SERVED THE NATION WELL AND WILL BE PRESERVED UNDER DOE STEWARDSHIP.

(U) IN SUMMARY, WE ARE DILIGENTLY PURSUING A CONSTRUCTIVE RESPONSE TO THE TASK GROUP'S RECOMMENDATIONS. IN MANY AREAS WE ARE PREPARING TO IMPLEMENT CHANGES WHICH FULLY ADAPT THE RECOMMENDATION. IN A FEW AREAS WE ARE STRIVING TO IMPROVE FURTHER ON THE RECOMMENDATIONS BY RESPONDING TO THE TASK GROUP'S CONCERN AND INTENT WHILE AVOIDING NEEDLESSLY COMPLEX PROCESSES. WE BELIEVE THAT, JUST AS THE TASK GROUP'S RECOMMENDATIONS WERE STRUCTURED AS A COHERENT SET, OUR IMPLEMENTATION ACTIVITIES TAKEN AS A WHOLE ARE A VERY RESPONSIVE, CONSTRUCTIVE, AND COHERENT APPROACH. WE ARE MAKING IMPROVEMENTS NOW, AND REFINEMENTS WILL CONTINUE AS THE NEW PROCESSES, PROCEDURES, AND MANAGEMENT ARRANGEMENTS MATURE OVER THE NEXT YEAR.

(U) WE BELIEVE THE TASK GROUP'S EFFORT HAS BEEN CONSTRUCTIVE IN ASSISTING US TO FOCUS MANAGEMENT ATTENTION. WE WILL STRIVE TO RETAIN AND ENHANCE THAT FOCUS ON MUTUAL DOD/DOE FISCAL DISCIPLINE ACROSS THE NUCLEAR WEAPONS PROGRAM AND OTHER DEFENSE NEEDS.

(U) IN A LESS FORMAL WAY THAN WHAT WILL SOON BE ESTABLISHED, THIS CLOSER COORDINATION IS ALREADY BEING

IMPLEMENTED. FOR THE BUDGET NOW BEFORE YOU, AFTER ASSESSING THE ABILITY OF THE ORIGINALLY PROPOSED DOE BUDGET REQUEST TO SUPPORT REQUIREMENTS CONSISTENT WITH THE DOD PROGRAM, OUR DEPARTMENTS REACHED AGREEMENT ON THE NEED TO AUGMENT THE DOE REQUEST, AT THE EXPENSE OF DECREMENTING AN ALREADY FINELY HONED DOD REQUEST, WITHIN THE CONSTRAINT OF THE ADMINISTRATION'S OVERALL NATIONAL DEFENSE BUDGET TARGET. THIS ACTION DEMONSTRATES OUR MUTUAL RECOGNITION THAT THE NATION'S DETERRENT CAPABILITY IS PROVIDED BY BOTH DEPARTMENTS IN CONCERT.

(U) THIS SPIRIT OF COOPERATION BETWEEN THE DEPARTMENTS HAS EXTENDED TO THE DOE PARTICIPATION IN THE PRESIDENT'S STRATEGIC DEFENSE INITIATIVE (SDI). IN ORDER TO CLARIFY THE DOE ROLE IN SDI, SECRETARY WEINBERGER AND SECRETARY HERRINGTON ISSUED A POLICY PAPER TO CLARIFY THE ROLE OF NUCLEAR RESEARCH IN REGARD TO THE SDI. THE PAPER REITERATES THE LONG-TERM GOAL OF A TRULY EFFECTIVE NONNUCLEAR DEFENSE, BUT ADDS THAT RESEARCH ON THE NUCLEAR DRIVEN CONCEPTS IS ESSENTIAL:

(1) TO DETERMINE THE FEASIBILITY AND EFFECTIVENESS OF COUNTERDEFENSIVE NUCLEAR DRIVEN SYSTEMS THAT AN ADVERSARY MAY DEVELOP FOR USE AGAINST FUTURE U.S. SURVEILLANCE AND DEFENSIVE SYSTEMS.

(2) TO UNDERSTAND THE TECHNICAL FEASIBILITY AND IMPACT THAT SUCH CONCEPTS MIGHT HAVE ON OUR DETERRENT FORCES IF UTILIZED IN SOVIET DEFENSIVE SYSTEMS.

(3) TO EXPLORE NUCLEAR DIRECTED ENERGY OPTIONS AS SDI POSSIBILITIES IF NEEDED.

(U) A WHITE HOUSE PRESS RELEASE ISSUED LAST SUMMER FURTHER SUPPORTED THIS POLICY, STATING, ". . . SOME HAVE ASKED ABOUT THE ROLE OF NUCLEAR-RELATED RESEARCH IN THE CONTEXT OF OUR ULTIMATE

GOAL OF NON-NUCLEAR DEFENSES. WHILE OUR CURRENT RESEARCH PROGRAM CERTAINLY EMPHASIZES NON-NUCLEAR TECHNOLOGIES, WE WILL CONTINUE TO EXPLORE THE PROMISING CONCEPTS WHICH USE NUCLEAR ENERGY TO POWER DEVICES WHICH COULD DESTROY BALLISTIC MISSILES AT GREAT DISTANCES. FURTHER, IT IS USEFUL TO STUDY THESE CONCEPTS TO DETERMINE THE FEASIBILITY AND EFFECTIVENESS OF SIMILAR DEFENSIVE SYSTEMS THAT AN ADVERSARY MAY DEVELOP FOR USE AGAINST FUTURE U.S. SURVEILLANCE AND DEFENSIVE OR OFFENSIVE SYSTEMS."

I WOULD LIKE TO STRESS THE IMPORTANCE TO DOD OF THE DOE SDI EFFORTS, INCLUDING THE X-RAY LASER. *DELETED*

DELETED

THE DOD PROGRAM SCHEDULE THEREBY ESTABLISHES A COMPATIBLE DOE PROGRAM SCHEDULE. BECAUSE OF RESULTS OF NUCLEAR TESTS AND SDI ARCHITECTURE STUDIES LAST SUMMER AND FALL, AFTER THE FY86 BUDGET WAS WELL ALONG, WE RECOGNIZED THE NEED TO ACCELERATE THE DOE PROGRAM TO MAINTAIN THIS COMPATIBILITY. THE DOD STRATEGIC DEFENSE INITIATIVE OFFICE HAS THUS FAR PROVIDED $38M TO THE DOE TO REIMBURSABLY FUND SDI RESEARCH IN DIRECT SUPPORT OF DOD MISSION RESPONSIBILITIES. SEPARATELY, THE TWO DEPARTMENTS AGREED ON THE NEED FOR AN ADDITIONAL $62M IN FY86 TO ACCELERATE SDI ACTIVITIES DIRECTLY WITHIN THE DOE MISSION AREA. TO ACCOMPLISH THIS, WE HAVE SUBMITTED A PROPOSED NO FUND SUPPLEMENTAL OR AN APPROPRIATION TRANSFER FROM THE DOD SDI ACTIVITY, AND I REQUEST YOUR SUPPORT IN EFFECTING THIS TRANSFER AS SOON AS POSSIBLE.

(U) THE $38M SUPPORTS EFFORTS DIRECTED IN DOD'S MISSION AREAS--SYSTEMS ANALYSIS, LETHALITY AND WEAPONS EFFECTS, AND OVERALL WEAPON SYSTEM DESIGN. A SUBSTANTIAL PART OF THIS EFFORT

IS BEST ACCOMPLISHED AT LAWRENCE LIVERMORE NATIONAL LABORATORY (LLNL), LOS ALAMOS NATIONAL LABORATORY (LANL), AND SANDIA NATIONAL LABORATORIES (SNL) BECAUSE OF THE EXPERTISE AVAILABLE THERE. THIS EFFORT WILL BE PURSUED THROUGH REIMBURSABLE CONTRACTS AT THESE LABORATORIES, JUST AS WORK OF THIS TYPE HAS BEEN DONE FOR DECADES.

IN PARTICULAR, $15M WILL BE USED TO PERFORM THE RESEARCH THAT WILL ALLOW

DELETED

AN ADDITIONAL $5M WILL BE USED TO PERFORM X-RAY LASER LETHALITY AND SYSTEM STUDIES AS WELL AS TO EVALUATE ACQUISITION, TRACKING, AND POINTING ISSUES.

(U) EIGHT MILLION DOLLARS IS ALLOCATED FOR RESEARCH ON HYPERVELOCITY PELLETS TO BETTER UNDERSTAND INTERACTION PHENOMENON AS WELL AS TO PERFORM SYSTEM STUDIES. FOUR MILLION DOLLARS WILL BE USED FOR THE STRATEGIC DEFENSE FACILITY AS REQUIRED BY LAST YEAR'S AUTHORIZATION LANGUAGE. THE SDF WILL BECOME A NATIONAL FACILITY TO SIMULATE WEAPONS EFFECTS AND TEST THE VULNERABILITY AND LETHALITY OF SDI SYSTEMS. THE REMAINING $6M IS IN A VARIETY OF SMALLER ACTIVITIES IN OTHER NDEW RESEARCH, PRIMARILY IN LETHALITY AND SYSTEMS STUDIES.

(U) WORK IN EACH OF THESE CATEGORIES HAS BEEN AUTHORIZED BY THE CONGRESS FOR FY86 BY THE DEPARTMENT OF DEFENSE AUTHORIZATION ACT, 1986 (TITLE II--RDT&E, TITLE XV--DEPARTMENT OF ENERGY NATIONAL SECURITY PROGRAM). IN PARTICULAR, AS PART OF THE FY86 BUDGET REQUEST, THE DOD SUBMITTED PROGRAM DESCRIPTIVE SUMMARIES THAT IDENTIFIED DOD NDEW ACTIVITIES AS PART OF THE DOD SDI DIRECTED ENERGY AND SURVIVABILITY, LETHALITY, AND KEY TECHNOLOGY PROGRAM ELEMENTS.

MONEY FOR THE NO FUND SUPPLEMENTAL WOULD ACCELERATE EFFORTS MORE CLOSELY RELATED TO DOE'S MISSION AREA.

DELETED

ACCELERATION OF THESE ACTIVITIES WAS DETERMINED TO BE ESSENTIAL, PRIOR TO ANY FY86 BUDGET REDUCTIONS, TO MAINTAIN COMPATIBILITY WITH SDIO DECISION MILESTONES. THE IMPACTS RESULTING FROM THE DOE SDI BUDGET REDUCTIONS MAKE THE NEED FOR THIS TRANSFER EVEN MORE ESSENTIAL.

(U) UNDERSTANDING THE FEASIBILITY OF NDEW IN GENERAL, AND THE X-RAY LASER IN PARTICULAR, IS A PARTICULARLY CRUCIAL DETERMINANT IN EFFICIENT PLANNING FOR THE OVERALL NATIONAL SDI R&D PROGRAM. IT IS IMPORTANT PARTLY BECAUSE, IF THE X-RAY LASER IS FEASIBLE, IT COULD BE A POTENT COUNTER-SDI WEAPON FOR THE SOVIETS, REQUIRING SDI ARCHITECTURES WHICH PROVIDE SURVIVABILITY AGAINST IT. IF IT IS NOT FEASIBLE, VERY DIFFERENT APPROACHES TO SURVIVABLE ARCHITECTURES MIGHT BE BEST FOR SDI.

DELETED

(U) IT IS TO BE EXPECTED, AND IT IS HEALTHY, THAT THERE WILL BE A WIDE RANGE OF OPINION ABOUT ANY PROGRAM OF THIS TECHNICAL DIFFICULTY AND POTENTIAL LEVERAGE. I URGE YOU NOT TO ALLOW CONFUSED PUBLICITY ABOUT THIS WORK TO DETRACT FROM YOUR APPRECIATION OF THE QUALITY OF ITS PLANNING, ITS ACCOMPLISHMENTS, OR ITS IMPORTANCE TO THE NATION. CONTINUED SUPPORT FOR THIS PROGRAM IS ESSENTIAL FOR ITS IMPLICATIONS NOT ONLY TO THE SDI PROGRAM BUT ALSO TO THE VULNERABILITY OF OUR PRESENT DETERRENT FORCES.

(U) THIS ABSOLUTELY ESSENTIAL SDI-RELATED RD&T CARRIED OUT BY DOE HAS HAD A SERIOUS IMPACT ON THE OVERALL NUCLEAR WEAPON RD&T PROGRAM, WHICH IS AN INDISPENSABLE BASIS FOR CONTINUED

STABLE DETERRENCE IN THE FUTURE. THE DIRECT MANPOWER FOR R&D, WHICH IS WHAT DETERMINES THE ACTUAL R&D PRODUCT, HAS ONLY INCREASED BY 15% FROM THE LOW POINT REACHED IN THE LATE 70'S AFTER A 40%, DECADE-LONG DECLINE. THIS MODEST RECENT GROWTH HAS NOT KEPT PACE WITH THE NEED TO SUPPORT FORCE MODERNIZATION, CURRENT OR FUTURE, NOR HAS IT KEPT PACE WITH DOD'S NUCLEAR-DETERRENCE RELATED RDT&E, WHICH HAS INCREASED BY 200% DURING THE PAST FIVE YEARS. THESE R&D LIMITATIONS HAVE FORCED DOE TO MAKE COMPROMISES IN THE R&D PROGRAM WHICH, IN MY OPINION, ENTAIL AN UNACCEPTABLE RISK.

(U) LET ME TURN NOW TO DOD NUCLEAR WEAPON PRODUCTION REQUIREMENTS, WHICH ARE ESTABLISHED ANNUALLY BY THE NUCLEAR WEAPONS STOCKPILE MEMORANDUM (NWSM) APPROVED BY THE PRESIDENT. DOE WEAPON PRODUCTION IS KEYED CLOSELY TO DOD DELIVERY SYSTEM SCHEDULES. EXCEPT FOR OCCASIONAL DOE PRODUCTION SCHEDULE ADJUSTMENTS TO ACHIEVE PRODUCTION EFFICIENCIES, WEAPON PRODUCTION RATES MATCH ESTABLISHED DOD REQUIREMENTS. THESE REQUIREMENTS ARE FREQUENTLY UPDATED, WITHIN THE FLEXIBILITY PROVIDED BY THE PRESIDENT, TO REFLECT CHANGES NECESSITATED BY A VARIETY OF FACTORS, INCLUDING ANY CHANGES TO PRODUCTION RATES OF ASSOCIATED DOD DELIVERY SYSTEMS. IN THE LAST YEAR, THE MILITARY LIAISON COMMITTEE, WHICH MEETS MONTHLY, APPROVED TEN CHANGES TO THE NWSM. THE CURRENT NWSM, RECENTLY SIGNED BY THE PRESIDENT, TAKES INTO ACCOUNT THE FY86 IMPACT OF THE DEFICIT REDUCTION ACT.

WITH REGARD TO PRODUCTION OF PLUTONIUM AND TRITIUM, WE HAVE A PROBLEM OF MAJOR STRATEGIC SIGNIFICANCE WITH WHICH TO DEAL. BY DINT OF REMARKABLE EFFORTS BY DOE OVER THE PAST FEW YEARS, EFFICIENCY OF THE AGING PRODUCTION REACTORS HAS BEEN INCREASED,

DELETED

NO PROGRESS HAS BEEN MADE TOWARD PROVIDING A RESILIENT NUCLEAR MATERIAL SUPPLY SYSTEM, ONE WHICH COULD ACCOMMODATE UNFORESEEN OUTAGES AND HAS SOME RESERVE CAPACITY FOR PRODUCTION RATE INCREASES WHICH MIGHT RESULT FROM SOVIET INITIATIVES. THIS IS A MAJOR STRATEGIC ASYMMETRY, SINCE THE ANALOGOUS SOVIET CAPABILITY IS NEW, ROBUST, AND GROWING.

(U) THE JOINT CHIEFS OF STAFF AND THE SECRETARY OF DEFENSE HAVE REPEATEDLY EXPRESSED CONCERN OVER THIS SITUATION. DOD BELIEVES IT IS IMPERATIVE TO PUT IN PLACE AN ISOTOPE SEPARATION FACILITY FOR WEAPON PLUTONIUM AND TO ACCELERATE PROGRESS TOWARD NEW PRODUCTION FACILITIES TO REPLACE THE ANCIENT REACTORS, AS WELL AS A SCRAP RECOVERY FACILITY. LOOKING AS FAR IN THE FUTURE AS THE LEAD TIMES FOR SUCH FACILITIES REQUIRES, MEANS THAT PLANNING FOR CONTINGENCIES, RATHER THAN ON THE BASIS OF CURRENT "BEST GUESSES," IS THE ESSENCE OF PLANNING. PLANNING FOR CONTINGENCIES THAT MIGHT NOT OCCUR IS DIFFICULT IN TIMES OF VERY TIGHT BUDGETS, BUT I URGE YOU TO ONCE AGAIN EXHIBIT THE FORESIGHT AND LEADERSHIP WHICH HAVE ALWAYS CHARACTERIZED THIS COMMITTEE'S STEWARDSHIP OF THIS PROGRAM, AND PROVIDE FOR THIS IMPORTANT MATERIAL NEED.

(U) THE DOE FY87 BUDGET REQUEST HAS BEEN DEVELOPED WITH CLOSE COOPERATION BETWEEN OUR DEPARTMENTS. IT IS ADEQUATE TO SUPPORT AN SDI ACTIVITY CONSISTENT WITH THE NATION'S SDI PROGRAM IF PROMPT ACTION IS TAKEN ON OUR FY86 APPROPRIATION TRANSFER REQUEST. THE REQUEST IS MARGINALLY ADEQUATE TO SUPPORT THE REMAINING RD&T ACTIVITIES NECESSARY TO SUPPORT THE DEVELOPMENT OF ADVANCED CONCEPTS FOR THE WARHEADS OF THE NEXT DECADE AND WILL SUPPORT THE WARHEAD PRODUCTION AND NUCLEAR MATERIALS PRODUCTION

ASSOCIATED WITH THE REQUIREMENTS OF THE NUCLEAR WEAPONS STOCKPILE MEMORANDUM. I REMAIN CONCERNED THAT THE FISCAL CONSTRAINTS OF THE PAST FEW YEARS HAVE FORCED US TO OPERATE WITH A HIGHER LEVEL OF RISK THAN I AM COMFORTABLE WITH. THE NEAR TERM, MORE EASILY QUANTIFIABLE REQUIREMENTS, HAVE BEEN SUPPORTED WHILE THOSE ACTIVITIES ASSOCIATED WITH MAINTAINING OUR CAPABILITY, SUCH AS RESTORATION, REVITALIZATION, AND PRODUCTIVITY RENTENTION, OPERATE AT THE MARGIN BECAUSE THE IMPACT OF LESS THAN FULL SUPPORT IS NOT AN ASSESSABLE LOSS OF PRODUCT, BUT RATHER AN INCREASE OF RISK.

(U) MODERNIZATION OF NONSTRATEGIC NUCLEAR FORCES (NSNF), AS WELL AS CONVENTIONAL FORCES, IS NECESSARY IN ORDER TO ENSURE A CONTINUING CREDIBLE DETERRENT. ALTHOUGH OUR NSNF SUPPORTS WORLDWIDE REQUIREMENTS, MOST ARE DEPLOYED IN SUPPORT OF NATO. SACEUR HAS RECENTLY COMPLETED A DETAILED STUDY OF HIS FUTURE REQUIREMENTS AS A CONSEQUENCE OF THE NATO NUCLEAR PLANNING GROUP DECISION AT MONTEBELLO IN OCTOBER 1983. I WILL BRIEFLY REVIEW SACEUR'S STUDY AND THE STATUS OF NSNF MODERNIZATION.

AT THE CONCLUSION OF THE UNILATERAL WITHDRAWAL OF 1,000 U.S. NUCLEAR WEAPONS FROM EUROPE IN 1981, NATO'S LAND-BASED TACTICAL NUCLEAR STOCKPILE WAS REDUCED FROM APPROXIMATELY DELETED WARHEADS. AT MONTEBELLO, NPG MINISTERS AGREED TO WITHDRAW AN ADDITIONAL 1,400 NUCLEAR WARHEADS FROM THE EUROPEAN STOCKPILE DURING THE FOLLOWING FIVE TO SIX YEARS. AT THE END OF 1985, THE NATO LAND-BASED NUCLEAR STOCKPILE HAD BEEN REDUCED TO ABOUT DELETED WARHEADS. SIGNIFICANT REDUCTIONS IN THE TOTAL OF TACTICAL BOMBS AND NIKE HERCULES HAVE BEEN ACHIEVED SINCE 1981, AND ALL REMAINING HONEST JOHN WARHEADS AND ATOMIC DEMOLITION MUNITIONS WERE WITHDRAWN FROM EUROPE IN 1985. BY THE END OF DELETED NATO'S LAND-BASED NUCLEAR STOCKPILE IS PLANNED TO BE REDUCED TO ABOUT DELETED WARHEADS--THE LOWEST LEVEL IN OVER TWENTY YEARS.

MINISTERS ALSO CONCLUDED AT MONTEBELLO THAT THE NATO ALLIANCE MUST, IN CONJUNCTION WITH WARHEAD WITHDRAWALS, TAKE THE NECESSARY ACTIONS TO IMPROVE ITS FORCES ACROSS THE ENTIRE SPECTRUM IN ORDER TO ENSURE A CONTINUING CREDIBLE DETERRENT. SPECIFICALLY, MINISTERS SUPPORTED THE NEED FOR SEVERAL IMPROVEMENT MEASURES IDENTIFIED BY THE NATO HIGH LEVEL GROUP:

DELETED

MINISTERS ALSO AGREED THAT THE REDUCTION TO DELETED WARHEADS SHOULD NOT BE AFFECTED BY THE DEPLOYMENT OF PERSHING II OR GLCM, I.E., THAT ONE EXISTING WARHEAD WOULD BE REMOVED FOR EACH PERSHING II OR GLCM WARHEAD DEPLOYED. PERSHING II DEPLOYMENTS ARE COMPLETE AND HAVE BEEN OFFSET BY PERSHING 1A WITHDRAWALS. CURRENTLY DELETED GLCM WARHEADS HAVE BEEN DEPLOYED TO NATO. THESE DELETED GLCM WARHEADS TO BE DEPLOYED BY DELETED WILL BE OFFSET BY FURTHER WITHDRAWLS (PRIMARILY BOMBS) FROM NATO'S LAND-BASED STOCKPILE.

SACEUR'S PLAN FOR ACHIEVING A DELETED NUCLEAR WEAPON STOCKPILE BY THE END OF 1988 IS OUTLINED IN HIS 1985 NUCLEAR WEAPONS REQUIREMENTS STUDY (NWRS). THE NWRS RECOMMENDATIONS INCLUDE: COMPLETING ONGOING NSNF MODERNIZATION PROGRAMS

DELETED

A SYSTEMATIC APPROACH WAS USED TO DETERMINE THE MINIMUM NUMBER, TYPE, AND LOCATION OF NUCLEAR WEAPONS REQUIRED TO HOLD AT RISK A RANGE OF WARSAW PACT TARGETS CONSIDERED NECESSARY TO DETER PACT AGGRESSION. WEAPON REQUIREMENTS WERE DEVELOPED USING A THREAT-ORIENTED METHODOLOGY WHICH CONSIDERS THE CONTRIBUTION OF NATO'S CONVENTIONAL FORCES DELETED THIS METHODOLOGY CONSIDERS THE POLICIES, OPERATION PLANS, AND

NUCLEAR TARGETING CONCEPTS WHICH HAVE BEEN DEVELOPED TO ACCOMPLISH NATO'S FLEXIBLE RESPONSE STRATEGY. IT INCLUDES THE NUCLEAR DELIVERY SYSTEMS AND WARHEADS PROJECTED TO BE IN NATO' LAND-BASED NUCLEAR STOCKPILE DURING THE STUDY TIMEFRAME. THE ANALYSIS ASSUMES, AND ITS RESULTS ARE DEPENDENT UPON:

- IMPROVEMENTS TO NATO'S NUCLEAR FORCES WHICH WILL ENHANCE THEIR SURVIVABILITY, RESPONSIVENESS, AND EFFECTIVENESS;
- DELETED
- DEPLOYMENT OF IMPROVED TARGET ACQUISITION, C^3I, AND INFORMATION PROCESSING SYSTEMS;
- DELETED
- IMPROVEMENTS TO NATO'S CONVENTIONAL FORCES.

I WOULD NOW LIKE TO COVER BRIEFLY IN SOMEWHAT MORE DETAIL SEVERAL FORCE IMPROVEMENT MEASURES WHICH ARE REQUIRED DELETED IN CONJUNCTION WITH THE REDUCTION OF NATO'S NUCLEAR STOCKPILE.

- COMPLETE GLCM AND PERSHING II DEPLOYMENTS. THESE DEPLOYMENTS ARE PROCEEDING ON SCHEDULE. ALL DELETED PERSHING II WARHEADS HAVE BEEN DEPLOYED TO U.S FORCES IN THE FEDERAL REPUBLIC OF GERMANY, AND DELETED GLCM WARHEADS HAVE BEEN DEPLOYED TO U.S. FORCES IN THE UNITED KINGDOM, DELETED ALL GLCM DEPLOYMENTS WILL BE COMPLETED BY DELETED

- COMPLETE DEPLOYMENT OF MODERN U.S. BOMBS. MODERNIZED B61-3 AND B61-4 BOMBS WITH DELETED AND ENHANCED SAFETY, SECURITY, AND COMMAND AND CONTROL HAVE BEEN DEPLOYED,

DELETED

DEPLOYMENT OF MODERNIZED BOMBS TO U.S. AIR FORCES IN EUROPE IS ABOUT DELETED COMPLETE, AND IS SCHEDULED FOR COMPLETION IN DELETED

DELETED

ADDITIONALLY, IN ACCORDANCE WITH THE PROVISIONS OF THE FY 1985 DOD AUTHORIZATION ACT, THE PRODUCTION PROGRAM FOR THE MODERNIZED DELETED W82 155MM NUCLEAR ARTILLERY ROUND HAS BEGUN. THE FINAL $10M TO COMPLETE THE DOE PRODUCTION FACILITIES IS REQUESTED THIS YEAR. THIS PROGRAM IS NECESSARY TO ACHIEVE SACEUR'S LONG-TERM OBJECTIVE OF MAKING THE 155MM THE PRINCIPAL NATO NUCLEAR ARTILLERY SYSTEM TO COUNTER EXTENSIVE SOVIET/WARSAW PACT NUCLEAR EXPANSION AND MODERNIZATION. THE W82 WILL REPLACE THE OBSOLETE, 22 YEAR OLD W48 AND WILL INCLUDE MODERN SAFETY, SECURITY, AND CONTROL DEVICES ALONG WITH PROVIDING INCREASED RELIABILITY, RANGE, AND ACCURACY. FIELDING IS PLANNED FOR DELETED

- COMPLETE CURRENT AIRCRAFT MODERNIZATION. THE MODERN F-16 AND TORNADO, WITH ENHANCED RANGE, SURVIVABILITY, AND PENETRATION CAPABILITY, ARE REPLACING THE OLDER F-4 AND F-104 AIRCRAFT IN NATO. THE F-16 IS BEING DEPLOYED WITH THE U.S., BELGIAN, DUTCH, GREEK, AND TURKISH AIR FORCES; DEPLOYMENT IS WELL UNDERWAY, AND WILL BE COMPLETED IN 1995. THE TORNADO IS BEING DEPLOYED WITH THE BRITISH, GERMAN, AND ITALIAN AIR FORCES; THE DEPLOYMENT PROGRAM IS EXPECTED TO BE COMPLETED IN 1991. ADDITIONALLY, THE DUAL-CAPABLE F-15E IS SCHEDULED TO BEGIN DEPLOYMENT WITH U.S. FORCES IN EUROPE IN 1992.

DELETED

- IMPROVE FORCE SURVIVABILITY.

DELETED

- IMPROVE CONVENTIONAL AND SUPPORT SYSTEMS. IMPROVEMENTS IN CONVENTIONAL MUNITIONS, TARGET ACQUISITION AND C^3I, AIR DEFENSE, BARRIER MUNITIONS, AND CAPABILITY TO ATTACK FOLLOW-ON FORCES ARE ALSO REQUIRED IN ORDER TO ACHIEVE THE DESIRED REDUCTION OF NSNF WEAPONS TO THE SPECIFIED *DELETED* LEVEL. THE U.S. AND NATO ALLIES ARE COMMITTED TO MODERNIZE THEIR CONVENTIONAL FORCES.

(U) THE U.S. STRATEGIC DETERRENCE DEPENDS ON THE TRIAD OF FORCES, INTERCONTINENTAL MISSILES, BOMBER DELIVERED WEAPONS, AND SUBMARINE LAUNCHED BALLISTIC MISSILES. THIS RANGE OF FORCES COMPLICATES SOVIET ATTACK PLANNING, DILUTES SOVIET FORCES, AND PROVIDES HEDGES AGAINST FAILURE OF OUR DETERRENCE BECAUSE OF TECHNOLOGICAL BREAKTHROUGH IN ANY SINGLE AREA.

(U) IN THE AREA OF THE BOMBER DELIVERED WEAPONS, THE THRUST OF OUR BUDGETARY REQUESTS IS TO RETIRE OR MODERNIZE OLD STRATEGIC BOMBS WHICH HAVE BEEN IN THE STOCKPILE FOR 20 TO 30 YEARS. ADDITIONALLY, WE WILL CONTINUE PRODUCTION OF A NEW STRATEGIC BOMB AS WELL AS WARHEADS FOR THE AIR-LAUNCHED CRUISE MISSILE AND ADVANCED CRUISE MISSILE, AND WILL CONTINUE FEASIBILITY STUDIES, TRADEOFF ANALYSES, AND COST STUDIES FOR THE REPLACEMENT FOR THE CURRENT SHORT-RANGE ATTACK MISSILE, NOW DESIGNATED AS SRAM II.

SPECIFICALLY, IN OUR BOMBER SYSTEMS MODERNIZATION, WE WILL COMPLETE OUR B28 BOMB (CARRIED IN B-52 BOMBERS) STOCKPILE IMPROVEMENT PROGRAM WHICH PROVIDES FOR ENHANCED ELECTRICAL SAFETY. ANOTHER MAJOR MODERNIZATION PROGRAM WHICH BEGAN IN FY85 IS THE IMPROVEMENT OF THE B61-1 BOMB (CARRIED BY

B-52, FB-111, B-1B AND ATB) BY CONVERTING IT TO A B61-7 BOMB WHICH INCORPORATES ENHANCED SAFETY FEATURES AND COMMAND AND CONTROL DEVICES. WE ANTICIPATE CONVERTING APPROXIMATELY

DELETED

WE WILL CONTINUE OUR PRODUCTION OF THE MODERN *DELETED* STRATEGIC BOMB, THE B83, WHICH IS COMPATIBLE WITH ALL CURRENT AND PROJECTED STRATEGIC BOMBERS. PRODUCTION OF THIS BOMB AT A RATE OF APPROXIMATELY *DELETED* PER YEAR ALLOWS US TO RETIRE B-28'S, AND EVENTUALLY WILL COMPRISE, ALONG WITH THE B61-7, OUR ENTIRE STRATEGIC BOMB STOCKPILE. OUR FINAL BOMBER CARRIED STRATEGIC SYSTEM WHICH WILL BE IN PRODUCTION IN FY87 IS THE W80-1 WARHEAD FOR THE AIR LAUNCHED CRUISE MISSILE, WHICH PROVIDES LONG-RANGE STANDOFF ATTACK CAPABILITY FOR OUR BOMBER FORCE. OUR PRODUCTION WILL BE APPROXIMATELY

DELETED

MISSILES COMPLETED. A FINAL STRATEGIC SYSTEM WHICH WILL CONTINUE TO BE DEVELOPED IN FY87 IS THE SRAM II. THE SRAM II WILL ENHANCE THE CAPABILITY OF THE BOMBERS TO PLACE HIGHLY DEFENDED TARGETS, HARDENED TARGETS, STRATEGIC RELOCABLE TARGETS, AT RISK. OF EQUAL IMPORTANCE--SRAM II WILL PROVIDE FOR THE ORDERLY RETIREMENT OF THE AGING SRAM MISSILE AND ITS W69 WARHEAD. DEVELOPMENT COST STUDIES WILL PROVIDE CANDIDATE DESIGNS, RECOMMENDATIONS, AND COST INFORMATION NECESSARY TO PRODUCE APPROXIMATELY *DELETED* WARHEADS FOR THE SRAM II. RESULTS WILL PROVIDE THE WARHEAD TECHNICAL INFORMATION NECESSARY TO FIELD THIS WEAPON, WHICH WILL PROVIDE OUR BOMBER FORCES WITH THE ESSENTIAL CAPABILITY TO KILL HARD TARGETS AT SURVIVABLE RANGES. THE PHASE 2 STUDY SHOULD BE COMPLETED IN MAY 1986, TO BE FOLLOWED BY A PHASE 2A STUDY THAT WILL IDENTIFY A BASELINE WARHEAD DESIGN AND ASSOCIATED COST INFORMATION.

(U) IN THE AREA OF INTERCONTINENTAL BALLISTIC MISSILES, THE BUDGET REQUEST SUPPORTS IMPROVEMENTS IN OUR HARD TARGET KILL CAPABILITY WITH THE MORE ACCURATE PEACEKEEPER (W87) SYSTEM, AND ALLOWS US TO CONTINUE OUR FEASIBILITY STUDIES OF THE SMALL ICBM. SPECIFICALLY, THE PEACEKEEPER SYSTEM WILL REACH ITS INITIAL OPERATIONAL CAPABILITY IN DECEMBER 1986 WITH DEPLOYMENT IN EXISTING MINUTEMAN SILOS. WE WILL FINISH STUDYING THE BASING MODE FOR THE SECOND 50 MISSILES IN FY87 AND WILL MAKE OUR RECOMMENDATIONS BASED ON THAT STUDY.

FOR THE SMALL ICBM, OUR FEASIBILITY STUDIES WILL PROVIDE CANDIDATE DESIGNS, RECOMMENDATIONS, AND COST INFORMATION NECESSARY TO PRODUCE *DELETED* PLUS WARHEADS FOR THE SMALL ICBM SYSTEM. THE PHASE 2 STUDY RESULTS WILL PROVIDE THE WARHEAD TECHNICAL INFORMATION NECESSARY TO FIELD THIS SURVIVABLE, MOBILE SYSTEM WHICH WILL HOLD SOVIET TARGETS AT RISK IN THE TRANS- AND POST-ATTACK PHASE OF CONFLICT. THE PHASE 2 STUDY SHOULD BE COMPLETED IN MARCH 1986, TO BE FOLLOWED BY A PHASE 2A STUDY THAT WILL IDENTIFY A BASELINE WARHEAD DESIGN AND ASSOCIATED COST INFORMATION.

WE WILL CONTINUE CONCEPT STUDIES TO ENSURE TECHNOLOGICAL SUPERIORITY AND TO SATISFY CHANGING DEFENSE NEEDS. THE AIR FORCE HAS INITIATED THE HARD TARGET KILL STUDIES TO IDENTIFY NUCLEAR WEAPON CONCEPTS TO HOLD *DELETED* TARGETS AT RISK BY OUR STRATEGIC FORCES.

PRELIMINARY TARGET ANALYSIS IN THE PACIFIC AND EUROPE HAS IDENTIFIED MORE THAN *DELETED* POTENTIAL TARGETS WHICH ARE WELL HARDENED OR ARE UNDERGROUND.

DELETED

CONCEPTS BEING INVESTIGATED INCLUDE EARTH PENETRATING WEAPONS AND HIGH ACCURACY DELIVERY SYSTEMS. WEAPONS FOUND TO BE EFFECTIVE AGAINST THESE TARGETS WILL BE IDENTIFIED IN RELATION TO EXISTING AND PLANNED BOMBER AND ICBM DELIVERY SYSTEMS.

WE ARE CONTINUING TO PURSUE TECHNOLOGIES THAT WILL PROVIDE METHODS TO DIRECTLY ATTACK DEFENSES AS WELL AS METHODS TO CONFUSE OR DISRUPT DEFENSE CAPABILITIES.

DELETED

THE SOON TO BE INITIATED STRATEGIC RELOCATABLE TARGET (SRT) STUDIES WILL ATTEMPT TO IDENTIFY EFFECTIVE NUCLEAR WEAPONS CONCEPTS TO ATTACK MOBILE TARGETS WITH OUR FORCES.

DELETED

THE RESULTS OF THESE STUDIES WILL COMPRISE PART OF THE AIR FORCE'S RESPONSE TO TASKING

DELETED

A DECISION TO PURSUE ANY OF THE RESULTING CONCEPTS WILL DEPEND UPON EFFECTIVENESS AGAINST THE SRT SET AND COST EFFECTIVENESS RELATIVE TO THE POTENTIAL SOLUTIONS.

(U) IN ADDITION TO THE MODERNIZATION OF OUR STRATEGIC DETERRENT, WE ARE ALSO EMBARKED ON A MODERNIZATION OF OUR INTERMEDIATE RANGE (THEATER) NUCLEAR FORCES. THESE FORCES ENHANCE OUR STRATEGIC DETERRENT BY ALLOWING A FLEXIBLE RESPONSE TO ANY SOVIET AGGRESSION AND PROVIDE A BALANCE TO AN OVERWHELMING SOVIET CONVENTIONAL FORCE SUPERIORITY. PROGRAMS OF COOPERATION WITH OUR NATO ALLIES ALLOW SHARING OF THE BURDEN OF THEATER DETERRENCE.

SIMILAR TO THE STRATEGIC BOMB MODERNIZATION PROGRAM, IN THE TACTICAL BOMB ARENA, WE ARE PRODUCING NEW BOMBS WITH THE MOST MODERN SAFETY AND COMMAND AND CONTROL FEATURES FOR USE BY U.S. FORCES AND OUR ALLIES IN THE HIGH TERRORIST THREAT AREAS OVERSEAS. THIS NEW PRODUCTION IS ALLOWING US TO RETIRE OLDER WEAPONS WHICH HAVE BEEN IN THE STOCKPILE FOR ALMOST 30 YEARS. THIS YEAR WE REACHED A MILESTONE: ALL TACTICAL BOMBS FOR OUR ALLIES *DELETED* ARE MODERNIZED AND MOST ALERT SORTIES IN EUROPE ARE ARMED WITH MODERN B61-3/4 BOMBS, WHICH HAVE INSENSITIVE HIGH EXPLOSIVE. THE RECENT DEFICIT REDUCTION ACT HAS SLOWED THE PACE OF MODERNIZATION BELOW WHAT WE BELIEVE IS NEEDED, BUT WE ARE CONTINUING TO PRESS ON, ALBEIT AT A SLOWER RATE.

SPECIFICALLY, WE ARE CONTINUING TO PRODUCE THE B61-3/4 TACTICAL BOMB WHICH IS CARRIED BY BOTH THE U.S. AND NATO DUAL-CAPABLE AIRCRAFT. OUR ANTICIPATED PRODUCTION RATE HAS BEEN CUT *DELETED* FOR FY87 TO APPROXIMATELY *DELETED* ADDITIONALLY, OUR B61-6/8 BOMB PROGRAM (PROVIDING ENHANCED STATE-OF-THE-ART COMMAND AND CONTROL FEATURES OVER THE B61-3/4) WHICH WAS IN ENGINEERING DEVELOPMENT WAS CANCELLED BECAUSE OF THE DEFICIT REDUCTION ACT. WE NOW PLAN TO CONTINUE BUILDING ADDITIONAL B61-3/4 BOMBS TO REPLACE THE B61-6/8'S, NECESSITATING RETIREMENT OF OLDER WEAPONS FARTHER IN THE FUTURE THAN HAD BEEN PLANNED BEFORE GRAMM-RUDMAN-HOLLINGS.

THE LAST MAJOR SYSTEM INCLUDED IN OUR THEATER NUCLEAR FORCE MODERNIZATION IS THE GROUND LAUNCHED CRUISE MISSILE (GLCM). THIS SMALL, ACCURATE MISSILE ENHANCES DETERRENCE BECAUSE IT ADDS ANOTHER ASPECT TO INTERMEDIATE RANGE NUCLEAR FORCES OVER AIRCRAFT DELIVERED WEAPONS, AND BECAUSE ITS MOBILE BASING MODE ENHANCES SURVIVABILITY. IN FY87, WE WILL CONTINUE TO PRODUCE MISSILES AT THE RATE OF APPROXIMATELY

DELETED

(U) THE DEPARTMENT OF ENERGY BUDGET, UNDER CONSIDERATION BY THIS SUBCOMMITTEE, SUPPORTS NAVY REQUIREMENTS IN STRATEGIC AND NON-STRATEGIC WARFARE. THE NAVY STRATEGIC WARHEAD REQUIREMENTS ARE DEDICATED SOLELY TO THE STRATEGIC BALLISTIC MISSILE SUBMARINE FORCE. THE NAVY NON-STRATEGIC WARHEAD PROGRAMS SUPPORT REQUIREMENTS FOR STRIKE WARFARE (ASHORE TARGETS), ANTI-SUBMARINE WARFARE, ANTI-AIR WARFARE, AND MARINE CORPS BATTLEFIELD WEAPONS.

(U) THE NAVY HAS EMBARKED ON A PROGRAM TO REVITALIZE OUR NON-STRATEGIC NUCLEAR WARFARE CAPABILITIES. THIS PROGRAM WAS INITIATED IN 1980 BY THE NAVY AND THE SECRETARY OF DEFENSE BECAUSE THE DETERRENT VALUE OF EXISTING NAVY NON-STRATEGIC WEAPONS HAD BEEN ERODED SIGNIFICANTLY BY THE GROWING SOVIET NUCLEAR THREAT. AN EXAMPLE OF THIS THREAT TO OUR NAVY IS EVIDENT IN THE LARGE NUMBER OF AIR- AND SUBMARINE-LAUNCHED ANTI-SHIP CRUISE MISSILES IN THE SOVIET NUCLEAR INVENTORY. IN SPITE OF THIS THREAT, THE NAVY MUST MEET ITS GLOBAL COMMITMENTS IN SUPPORT OF THE MARITIME STRATEGY--THE NAVY ELEMENT OF NATIONAL MILITARY STRATEGY. THE MARITIME STRATEGY REQUIRES THAT U.S. NAVAL FORCES OPERATE IN FORWARD DEPLOYED REGIONS, WHICH INCLUDES AN EVER PRESENT UNCERTAINTY OF NUCLEAR ATTACKS ON OUR FLEET BY SOVIET LAND-BASED AND AT-SEA FORCES. THE NAVY THEATER NUCLEAR WARFARE (TNW) MODERNIZATION PROGRAM IS DESIGNED TO REMOVE ANY INCENTIVE FOR THE SOVIETS TO USE THEIR NUCLEAR WEAPONS AT SEA. THIS PROGRAM REQUIRES HARDENING OUR SHIPS AND AIRCRAFT AGAINST THE EFFECTS OF NUCLEAR WEAPONS, SUCH AS BLAST, RADIATION, AND ELECTROMAGNETIC PULSE. IT REQUIRES A COMPREHENSIVE THEATER NUCLEAR WARFARE TRAINING PROGRAM. IT ALSO REQUIRES THAT THE NAVY SELECTIVELY MODERNIZE ITS AGING NUCLEAR WEAPONS AND ENSURE THAT THEY ARE EFFECTIVE AGAINST THE THREAT. THESE IMPROVEMENTS COMBINE TO DETER SOVIET USE OF

NUCLEAR WARFARE AT SEA BY RAISING THE LEVEL OF UNCERTAINTY THAT SUCH ATTACKS WOULD SERVE THEIR WAR AIMS.

IT IS NOT DEPARTMENT OF DEFENSE POLICY TO BUY NUCLEAR WEAPONS AUTOMATICALLY AS REPLACEMENTS FOR SYSTEMS BEING RETIRED. WE REQUIRE A CLEAR CASE FOR THE UTILITY OF EACH WEAPON. NUCLEAR WEAPONS SHOULD NOT SERVE AS SUBSTITUTES FOR CONVENTIONAL WEAPONS WHERE IMPROVED CONVENTIONAL WEAPONS WILL SUFFICE. WE WILL PROCURE ONLY THOSE NUCLEAR WEAPONS WHICH PROVIDE A UNIQUE AND SUBSTANTIAL MILITARY CAPABILITY. FOR EXAMPLE, TWO YEARS AGO, THE NAVY STUDIED THE REQUIREMENT FOR AN AIR-DELIVERED STAND-OFF NUCLEAR WEAPON FOR AN ANTI-SHIP ROLE.

DELETED

THE POINT IS THAT THE NAVY NUCLEAR WEAPONS MODERNIZATION PROGRAM IS WELL-DEFINED, IN CONSONANCE WITH DOD POLICY, AND INTEGRATED WITH THE NAVY'S CONVENTIONAL CAPABILITY.

ONE OF THE MOST SIGNIFICANT RECENT DEVELOPMENTS IN THE NAVY'S NUCLEAR WEAPONS CAPABILITY IS THE TOMAHAWK NUCLEAR LAND ATTACK CRUISE MISSILE, OR TLAM/N. TOMAHAWK IS PLANNED FOR SSN-637 AND SSN-688 CLASS ATTACK SUBMARINES; DD-963 AND DDG-51 CLASS DESTROYERS; CGN-9, 38 AND CG-47 CLASS CRUISERS; AND BB-61 CLASS BATTLESHIPS. THESE SHIP AND SUBMARINE CLASSES WILL BE CAPABLE OF CARRYING ALL TOMAHAWK VARIANTS IN ANY DESIRED MIX. TLAM/N WILL GREATLY ENHANCE THE NAVY'S DETERRENCE POSTURE BY DISTRIBUTING NAVY RETALIATORY STRIKING POWER ACROSS A LARGE NUMBER OF NAVAL PLATFORMS. THIS WILL INCREASE THE NUMBER OF WARSAW PACT TARGETS THAT ARE PUT AT RISK AND GREATLY COMPLICATE SOVIET DEFENSIVE EFFORTS. TOMAHAWK COMPLEMENTS THE POWER OF THE CARRIER AIR WING AND MULTIPLIES THE EFFECTIVENESS OF THE FORCE AT SEA. TLAM/N WILL ALSO CONTRIBUTE TO THE NCA'S ABILITY TO DETER STRATEGIC CONFLICT AND WILL PROVIDE ADDITIONAL SURVIVABLE ASSETS FOR THE NUCLEAR RESERVE FORCE. TLAM/N

REACHED INITIAL OPERATIONAL CAPABILITY (IOC) IN JUNE, 1984. AT PRESENT *DELETED* NAVY SHIPS AND SUBMARINES ARE CERTIFIED TO CARRY TLAM/N. WITHIN THE NEXT FIVE YEARS, *DELETED* TLAM/N MISSILES WILL BE DEPLOYED IN *DELETED* SHIPS AND SUBMARINES.

WITH THE EXCEPTION OF TLAM/N, THE NAVY HAS NOT DEPLOYED A NEW NON-STRATEGIC NUCLEAR WEAPON SINCE 1964. MOST OF THE EXISTING NAVY NON-STRATEGIC NUCLEAR WEAPONS WERE DESIGNED IN THE NINETEEN FIFTIES, DEPLOYED IN THE EARLY SIXTIES, *DELETED*

THE DOE BUDGET BEING CONSIDERED BY THIS SUBCOMMITTEE ALSO SUPPORTS DEVELOPMENT OF THE W81 WARHEAD FOR THE NUCLEAR VERSION OF THE STANDARD SURFACE TO AIR MISSILE, SM-2(N). THE SECRETARY OF THE NAVY SUBMITTED A REPORT TO CONGRESS REGARDING THE SM-2(N), AS REQUIRED BY THE FY86 DOD AUTHORIZATION CONFERENCE, IN DECEMBER 1985. DUE TO APPROPRIATION OF LESS THAN ONE-THIRD OF THE FY86 BUDGET REQUEST, THE NAVY WAS REQUIRED TO RESTRUCTURE THE SM-2(N) PROGRAM. THE DOE BUDGET SUPPORTS THIS RESTRUCTURED EFFORT. THE REQUIREMENT FOR THIS NUCLEAR SELF-DEFENSE MISSILE IS VERY REAL. *DELETED*

THE SM-2(N) IS A DETERRENT SYSTEM AND HAS A UNIQUE, WELL-DEFINED ROLE *DELETED* IT DETERS SOVIET USE OF NUCLEAR WEAPONS AT SEA BY INCREASING THE PROBABILITY THAT SUCH AN ATTACK ON THE U.S. FLEET WOULD FAIL.

ANOTHER KEY WARFARE AREA IS ANTI-SUBMARINE WARFARE (ASW). SOVIET SUBMARINE IMPROVEMENTS INCLUDE MORE DAMAGE RESISTANT DOUBLE HULL DESIGNS, TITANIUM HULL CONSTRUCTION, DEEPER OPERATING CAPABILITIES, AND TORPEDO COUNTERMEASURES, *DELETED* IN ORDER TO DEAL WITH THESE FASTER, QUIETER, AND MORE SURVIVABLE SOVIET SUBMARINES, NEW ASW WEAPONS ARE REQUIRED.

DELETED

THE ASW STAND-OFF WEAPON (ASW SOW), NOW NAMED SEA LANCE, IS A NUCLEAR-CAPABLE SUBMARINE-LAUNCHED ROCKET, AND IS REQUIRED TO REPLACE SUBROC.

DELETED

(U) IN FY 1986, THE CONGRESS FULLY SUPPORTED THE NAVY'S REQUESTED FUNDING FOR THE SEA LANCE (ASW SOW) RDT&E. HOWEVER, THE CONGRESS AUTHORIZED ONLY $10 MILLION AND APPROPRIATED ONLY $5 MILLION OF THE $16 MILLION REQUESTED BY THE DOE FOR CONSTRUCTION OF FACILITIES TO PRODUCE THE SEA LANCE NUCLEAR PAYLOAD. IT IS VITALLY IMPORTANT THAT THE DOE PROGRAM KEEP PACE WITH THE NAVY'S SEA LANCE MISSILE DEVELOPMENT PROGRAM, AND WE REQUEST YOUR SUPPORT OF THE FUNDING THAT DOE HAS REQUESTED IN FY 1987 FOR SEA LANCE (ASW SOW) CONSTRUCTION PROJECTS.

FOR OUR ASW AIRCRAFT FORCES, A NEW AIR-DELIVERED NUCLEAR DEPTH BOMB IS REQUIRED. IT IS EXPECTED THAT THIS MODERNIZED DEPTH BOMB, LIKE THE B57 IT REPLACES, WILL HAVE A STRIKE CAPABILITY AS WELL. THE NAVY AND THE DOE ARE IN THE EARLY STAGES OF A PHASE 2A STUDY TO DETERMINE WHETHER THIS BOMB WILL BE A VARIANT OF THE SEA LANCE (ASW SOW) WARHEAD OR OF THE B61 WARHEAD. IT IS EXPECTED THAT IF THE PHASE 2A STUDY CALLS FOR A COMMON ASW/STRIKE BOMB, IT WILL SUPPLANT THE OLDER B43, B57, AND B61-2 AND -5 TACTICAL STRIKE BOMBS AND B57 DEPTH BOMBS *DELETED* THIS COMMONALITY SHOULD ALLOW SMALLER AIRCRAFT CARRIER LOADOUTS THAN WOULD OTHERWISE BE POSSIBLE WITH SEPARATE TACTICAL STRIKE AND DEPTH BOMBS, THEREBY REDUCING OVERALL STOCKPILE NUMBERS OF FLEET STRIKE AND DEPTH BOMBS. BOTH OF THESE NEW NUCLEAR WEAPONS, THE SEA LANCE (ASW SOW) AND THE NUCLEAR DEPTH BOMB, HAVE AN INITIAL OPERATIONAL CAPABILITY (IOC) *DELETED*

SHIFTING NOW TO STRATEGIC SYSTEMS, THERE ARE EIGHTEEN POSEIDON C-3 SUBMARINES, AND EACH SUBMARINE CARRIES SIXTEEN MISSILES. EACH C-3 MISSILE IS LOADED WITH DELETED W68 WARHEADS. THE W68 BUILDING PROGRAM IS LONG COMPLETED; THE LAST W68 WAS DELIVERED TO THE NAVY IN 1975. DOE IS, HOWEVER, CONDUCTING A RETROFIT PROGRAM FOR THE W68 BECAUSE THESE C-3 MISSILES WILL BE USED IN POSEIDON SUBMARINES THROUGH THE 1990S. DELETED THESE WARHEADS ARE BEING MODERNIZED WITH SAFETY AND FIRING CIRCUIT MODIFICATIONS.

THE DELETED W76 WARHEAD TODAY SUPPORTS THE TRIDENT I (C-4) MISSILE. TWELVE POSEIDON SSBNS, ORIGINALLY DESIGNED TO CARRY THE C-3 MISSILE, HAVE BEEN MODIFIED TO CARRY SIXTEEN C-4S, EACH WITH A PAYLOAD OF DELETED W76 WARHEADS. THE FIRST EIGHT TRIDENT SUBMARINES, FIVE OF WHICH ARE NOW MAKING PATROLS, WILL EACH CARRY 24 C-4 MISSILES. THE EIGHTH TRIDENT SUBMARINE WILL BE DELIVERED THIS MAY.

DELETED

THE TRIDENT II (D-5) MISSILE IS NOW IN ITS THIRD YEAR OF FULL-SCALE ENGINEERING DEVELOPMENT. DOE IS DEVELOPING THE W88 DELETED WARHEAD FOR THIS MISSILE. DELETED THE D-5 WILL PROVIDE OUR SURVIVABLE, SEA-BASED STRATEGIC FORCE WITH GREATLY IMPROVED DETERRENT CAPABILITY. D-5 WILL FIRST BECOME OPERATIONAL WHEN IT GOES TO SEA IN THE NINTH TRIDENT SUBMARINE FROM ITS HOME BASE AT KINGS BAY, GEORGIA. ALL SUBSEQUENT NEW CONSTRUCTION TRIDENTS WILL BE D-5 EQUIPPED.

(U) THE ORIGINAL EIGHT TRIDENTS WILL BE BACKFITTED WITH THE D-5 SYSTEMS DURING OVERHAUL, BEGINNING IN THE EARLY 1990S, AND THE SUBMARINE BASE AT BANGOR, WASHINGTON, WILL BE EQUIPPED TO SUPPORT D-5 BY 1994 AS WE PROCEED TOWARD AN ALL D-5 TRIDENT FORCE.

THE TRIDENT II D-5 MISSILE WILL CARRY DELETED WARHEADS. THE FIRST TRIDENT SSBNS EQUIPPED FOR D-5 WILL CARRY DELETED THE WARHEAD. AS W76 WARHEADS BECOME AVAILABLE FROM RETIRING POSEIDON (C-4) SUBMARINES AND FROM THE FIRST EIGHT TRIDENTS,

DELETED

(U) BEFORE CLOSING, THE CONTINUING INVULNERABILITY OF OUR BALLISTIC MISSILE SUBMARINES MUST BE EMPHASIZED. AFTER COMPLETING 2,393 STRATEGIC DETERRENT PATROLS SINCE 1960, EVERYTHING WE KNOW AT EVERY LEVEL OF SECURITY CLASSIFICATION CONVINCES ME THAT THE SOVIETS CANNOT FIND OUR MISSILE SUBMARINES NOW AND WILL NOT BE ABLE TO FIND THEM FOR THE FORESEEABLE FUTURE. ALL WHO ARE FAMILIAR WITH OUR SECURITY EFFORTS AGREE WITH THIS ASSESSMENT. THE SITUATION IS DYNAMIC, AND WE MUST CONTINUE OUR VIGOROUS EFFORTS TO ENSURE WE REMAIN AHEAD OF THE THREAT. THIS SURVIVABILITY OF OUR STRATEGIC SUBMARINES EQUATES TO STABILITY IN A CRISIS. SINCE OUR SSBNS CANNOT BE ATTACKED SUCCESSFULLY, NO ENEMY IS LIKELY TO INITIATE AGGRESSION WHEN HIS ATTACK CANNOT DENY OUR CAPABILITY TO RETALIATE EFFECTIVELY. DOE'S SUPPORT OF THE NAVY'S STRATEGIC PROGRAMS IS MOST IMPORTANT TO OUR NATION'S DETERRENT CAPABILITY.

(U) I WOULD NOW LIKE TO ADDRESS TWO RECENT LEGISLATIVE ACTIONS WHICH I BELIEVE HAVE SERIOUS IMPLICATIONS FOR THE SECURITY OF THE UNITED STATES AND ITS ALLIES. THOSE TWO ACTIONS ARE HOUSE JOINT RESOLUTION-3, AND OF EVEN MORE CONCERN, HOUSE BILL 3442, BOTH OF WHICH WOULD HAVE THE UNITED STATES CEASE ALL TESTING OF NUCLEAR WEAPONS. AS YOU KNOW, FOR THE PAST TWENTY-FIVE YEARS, WE HAVE CONSISTENTLY REJECTED PROPOSALS

CALLING FOR A MORATORIUM ON TESTING. THESE REJECTIONS GREW OUT OF OUR BITTER EXPERIENCE WITH THE LAST MORATORIUM (1958-1961). IN PRESIDENT KENNEDY'S WORDS, "WE KNOW ENOUGH NOW ABOUT BROKEN NEGOTIATIONS, SECRET PREPARATIONS, AND THE ADVANTAGES GAINED FROM A LONG TEST SERIES NEVER TO OFFER AGAIN AN UNINSPECTED MORATORIUM."

(U) HOWEVER, OUR OPPOSITION TO A MORATORIUM GOES DEEPER THAN AN HISTORICAL LESSON WE HAVE PURPOSEFULLY ELECTED NOT TO REPEAT. SPECIFICALLY, TESTING OF EQUIPMENT WHICH INVOLVES OUR VITAL INTERESTS AND SAFETY HAS BEEN INGRAINED INTO OUR ENTIRE TECHNOLOGICAL HERITAGE. WE KNOW THAT EVEN THE BEST DESIGNED AND CONSTRUCTED DEVICES CAN FAIL TO FUNCTION AT PARTICULARLY CRITICAL TIMES. THAT OBSERVATION IS THE REASON WE TEST ELEVATORS, AIRPLANES, AND AUTOMOBILES. IT IS THE REASON WHY WE TEST NUCLEAR WEAPONS--TO ESTABLISH AND MAINTAIN CONFIDENCE IN THEIR RELIABILITY AND TO INSURE THEIR SAFETY. THEREFORE, IT SHOULD BE BEYOND DEBATE THAT AS LONG AS WE ARE OBLIGATED TO RELY ON THE RETALIATORY CAPABILITIES OF NUCLEAR WEAPONS TO SECURE OUR NATION AND ITS VALUES, IT WOULD BE IRRESPONSIBLE TO FOREGO TESTING OF THOSE CRUCIAL CAPABILITIES. THE FACT THAT THERE *IS* DEBATE ON THIS SELF-EVIDENT TECHNICAL POINT SHOWS EITHER THE TECHNOLOGICAL NAIVETE OF SOME WHO OPPOSE TESTING OR THEIR WILLINGNESS TO LET TECHNICAL JUDGMENT BE COMPROMISED BY POLITICAL BIASES.

(U) I REALIZE SOME HAVE ARGUED THAT SINCE, IN THE ABSENCE OF TESTING OF NUCLEAR WEAPONS, RELIABILITY WOULD BE REDUCED, THERE WOULD BE LESS RELIANCE ON THE NUCLEAR ARSENALS IN THE WORLD, AND THIS WOULD EVENTUALLY LEAD TO NUCLEAR DISARMAMENT. ON THE CONTRARY, THIS THESIS NOT ONLY WOULD BE DANGEROUS IF IMPLEMENTED, BUT IT OVERLOOKS THE FACT THAT THE GENERALLY STABILIZING SYSTEM DEVELOPMENTS OF THE PAST TWENTY YEARS, INCLUDING THE MAJOR REDUCTION IN THE SIZE AND DESTRUCTIVE POTENTIAL OF OUR NUCLEAR STOCKPILE SINCE THE 1960'S, ARE DIRECT PRODUCTS OF OUR TECHNOLOGY AND OUR ABILITY TO TEST THAT TECHNOLOGY. RATHER THAN LEAD TO NUCLEAR DISARMAMENT, WHAT WOULD REALLY HAPPEN IS THAT BOTH SIDES WOULD COMPENSATE FOR WORST CASE ESTIMATES OF UNRELIABILITY BY USING HIGHER YIELDS AND BY DEPLOYING MORE WARHEADS. AS FAR AS NATIONAL SECURITY IS CONCERNED, RELYING ON UNCERTAINTY, ESPECIALLY ON SYMMETRY OF UNCERTAINTY, IS EXTREMELY RISKY.

(U) HJR-3 ARGUES THAT A MORATORIUM ON NUCLEAR TESTING "WOULD STRENGTHEN OUR EFFORTS TO PREVENT THE PROLIFERATION OF NUCLEAR WEAPONS." HOWEVER, IT IS DIFFICULT TO SEE HOW A NUCLEAR TEST BAN COULD PROVIDE AN INCENTIVE FOR NONNUCLEAR WEAPON STATES TO FORESWEAR THE ACQUISITION OF NUCLEAR WEAPONS. A GIVEN COUNTRY'S QUEST TO BECOME A NUCLEAR WEAPON STATE MUST BE GOVERNED BY TWO PRINCIPAL FACTORS, WHICH ARE UNRELATED TO NUCLEAR TESTING BY THE SUPERPOWERS. FIRST, THE COUNTRY MUST PERCEIVE A NEED TO DEVELOP A NUCLEAR EXPLOSIVE CAPABILITY. SECOND, ONCE HAVING DECIDED TO DEVELOP A NUCLEAR OPTION, THE COUNTRY MUST HAVE ACCESS TO THE TECHNOLOGIES AND MATERIALS NECESSARY FOR THE FABRICATION OF A NUCLEAR DEVICE. THE PERCEPTION OF NEED IS LIKELY TO BE DETERMINED BY A COMPLEX MIXTURE OF PERCEIVED EXTERNAL THREATS AND SUCH THINGS AS NATIONAL PRIDE AND INTERNAL POLITICAL FORCES. NUCLEAR TESTING BY THE U.S. OR THE SOVIET UNION, FOR THAT MATTER, ADDS LITTLE OR NOTHING TO EITHER FACTOR. A NUCLEAR TEST BAN IN SOME WAYS COULD ACTUALLY ENCOURAGE PROLIFERATION. FOR EXAMPLE, IF A NATION, NOW UNDER THE PROTECTION OF U.S. NUCLEAR GUARANTEES, LOST CONFIDENCE IN U.S. NUCLEAR CAPABILITY, IT MIGHT WELL DECIDE THAT ITS SECURITY INTERESTS REQUIRED THE ACQUISITION OF AN INDIGENOUS NUCLEAR FORCE.

(U) MOREOVER, WE NEED TO REMEMBER THAT A POTENTIAL PROLIFERATOR, WHO CHOOSES TO BE BOUND BY A TEST BAN, COULD STILL PRODUCE UNSOPHISTICATED NUCLEAR WEAPONS WITHOUT TESTING. SUCH AN UNTESTED WEAPON COULD HAVE A SIGNIFICANT MILITARY IMPACT IN REGIONAL CONFLICTS EVEN THOUGH THERE WOULD BE SOME UNCERTAINTY IN THE YIELD AND PERFORMANCE OF SUCH A WEAPON. IT IS WORTH NOTING THAT EVEN IN 1945 WHEN NUCLEAR TECHNOLOGY WAS STILL IN ITS INFANCY, THE UNITED STATES DID NOT TEST THE FIRST NUCLEAR WEAPON USED IN WAR.

(U) HR-3442 ARGUES THAT A "MUTUAL AND SIMULTANEOUS CESSATION OF THE TESTING OF NUCLEAR WARHEADS BY THE UNITED STATES AND THE SOVIET UNION WOULD GIVE A POSITIVE INDICATION OF A SINCERE DESIRE BY BOTH NATIONS TO END THE NUCLEAR ARMS RACE." THIS INDICATION, IT IS FURTHER ARGUED, "WOULD PROVIDE THE PROPER CLIMATE FOR CURRENT AND FUTURE NUCLEAR ARMS CONTROL NEGOTIATIONS." HOWEVER, WE KNOW FROM EXPERIENCE WHAT WILL HAPPEN WHEN WE ENTER INTO AN AGREEMENT WHICH IS NOT VERIFIABLE. THE UNRATIFIED THRESHOLD TEST BAN TREATY PROVIDES A CASE IN POINT. BECAUSE OF IMPRECISIONS AND LIMITATIONS IN OUR NATIONAL TECHNICAL MEANS, WE CANNOT ACCURATELY ASSESS THE YIELDS OF SOVIET NUCLEAR TESTS. NEITHER CAN THE SOVIETS ACCURATELY ASSESS OUR YIELDS. AS A RESULT OF THE MORASS OF UNCERTAINTY, THE UNITED STATES AND THE SOVIET UNION HAVE SPENT THE PAST DECADE EXCHANGING WHITE PAPERS ACCUSING EACH OTHER OF EXCEEDING THE PERMITTED 150 KILOTON THRESHOLD. IT IS DIFFICULT TO SEE HOW SUCH A SITUATION, WHICH WOULD CERTAINLY BE REPEATED FOLLOWING A MORATORIUM, WOULD SERVE TO FOSTER AN IMPROVED CLIMATE BETWEEN OUR TWO NATIONS. NOT BEING SURE WHERE THE PROPERTY LINE LIES AND NOT BEING SURE HOW TO MEASURE IT HAS NEVER MADE FOR NEIGHBORLY RELATIONS.

(U) HJR-3 FURTHER ARGUES THAT A MUTUAL MORATORIUM ON NUCLEAR WEAPONS TESTING WOULD PROMOTE THE SECURITY OF THE UNITED

STATES BY CONSTRAINING THE UNITED STATES' NUCLEAR ARMS COMPETITOR, THE SOVIET UNION. HOWEVER, INHERENT IN THIS ARGUMENT IS THE ASSUMPTION THAT THE UNITED STATES AND THE SOVIET UNION RELY EQUALLY ON TECHNOLOGY TO ACHIEVE THEIR NATIONAL SECURITY OBJECTIVE. BUT THIS ASSUMPTION IS ALMOST CERTAINLY WRONG, AS THE FOLLOWING POINTS WILL ILLUSTRATE.

(U) SECURITY: IN THE CLOSED SOVIET SOCIETY, THE SECURING OF NUCLEAR WEAPONS CAN BE ACHIEVED QUITE EFFECTIVELY THROUGH THE EXERCISE OF SUMMARY POLICE POWERS, CENSORSHIP, AND SIMILAR METHODS WHICH OUR SOCIETY WOULD FIND ABHORRENT. IN CONTRAST, WE HAVE ELECTED TO PROVIDE THE REQUISITE SECURITY FOR NUCLEAR WEAPONS THROUGH TECHNOLOGICAL MEANS, MANY OF WHICH ARE INTEGRAL TO THE WEAPON DESIGNS. OUR APPROACH, WHILE IN CONCERT WITH OUR SOCIETAL VALUES, IS NOT WITHOUT COSTS. ONE OF THOSE COSTS WOULD BE A GREATER TENDENCY TOWARD DETERIORATION IN A NO-TEST ENVIRONMENT.

SAFETY: THE UNITED STATES--AND NO DOUBT THE SOVIET UNION AS WELL--EXERCISES CARE THAT NUCLEAR WEAPONS PRODUCE NO NUCLEAR YIELD EVEN IN THE UNLIKELY EVENT OF AN ACCIDENT. FOR US, SAFETY IS NOT A MATTER OF COST TRADEOFFS; IT IS AN ABSOLUTE. AS SYSTEMS, STRATEGIES, AND THREATS CHANGE, THE REQUIREMENT FOR SAFETY REMAINS IMMUTABLE. OUR CONCERN FOR SAFETY HAS LED US TO INCORPORATE FEATURES WITHIN THE WEAPON DESIGN ITSELF WHICH, WITHOUT CAREFUL TESTING, COULD BE AT CROSS-PURPOSES WITH THE OPERABILITY OF THE WEAPON. WE LEARNED THIS LESSON WELL WHEN A FEATURE

DELETED

WAS INCORPORATED INTO STOCKPILED WEAPONS DURING THE 1959-1960 MORATORIUM. A SUBSEQUENT STOCKPILE CONFIDENCE TEST REVEALED THAT THE SAFETY FEATURE WOULD HAVE PRECLUDED DETONATION EVEN IF THE WEAPON HAD BEEN CALLED ON TO PERFORM ITS MILITARY MISSION.

DELETED

OUR GOAL IS TO STOCKPILE WEAPONS WHICH ARE BOTH OPERABLE AND SAFE. TO ACHIEVE THAT GOAL AND TO INSURE THAT THE TWO OBJECTIVES ARE NOT IN CONFLICT, WE MUST CONTINUE TO TEST OUR NUCLEAR WEAPONS UNDER REALISTIC CONDITIONS--COMPUTER SIMULATIONS AND COMPONENT TESTING WILL NOT SUFFICE.

COLLATERAL DAMAGE REDUCTION:

DELETED

WE HOLD THAT REDUCING POTENTIAL COLLATERAL DAMAGE, IF DETERRENCE WERE TO FAIL, IS NOT ONLY A MORAL IMPERATIVE; IT ALSO IS DIRECTLY RELATED TO DETERRENCE ITSELF. A DETERRENT POSTURE WOULD BE LESS CREDIBLE IN A CRISIS SITUATION IF AN ADVERSARY THOUGHT WE MIGHT NOT RETALIATE BECAUSE OF THE CONSEQUENCES OF EXCESSIVE DESTRUCTION. THIS CONCERN ON OUR PART TO REDUCE COLLATERAL DAMAGE IS REFLECTED IN HOW WE DESIGN OUR WEAPONS.

DELETED

ENVIRONMENTAL CONTROLS:

DELETED

MILITARY CHARACTERISTICS/TARGET BASE: THIS FINAL ASPECT OF ASYMMETRY IS COMPLICATED, BUT IT GOES TO THE HEART OF THE ISSUES OF THE RELATIVE IMPACT OF TEST BANS ON THE US AND USSR. IN THE CASE OF THE US,

DELETED

THUS, FOR THESE HARD TARGETS TO BE POTENTIALLY PLACED AT RISK, OUR DESIGNERS HAVE HAD TO CONSIDER HIGHER YIELDS.

DELETED

IN CONTRAST, THE SOVIETS ARE NOT CONFRONTED WITH A HARD TARGET BASE--EXCEPT FOR OUR MISSILE SILOS AND A FEW OTHER FACILITIES. MOREOVER,

DELETED

WILL GIVE THE SOVIETS AN EDGE UNDER ANY TEST BAN REGIME INCLUDING ONE ESTABLISHED BY A VERIFIABLE THRESHOLD TEST BAN TREATY. THIS WOULD EVEN BE MORE TRUE IN A REGIME ESTABLISHED BY A COMPREHENSIVE TEST BAN TREATY.

(U) IN CONCLUSION, THERE ARE FUNDAMENTAL DIFFERENCES IN THE WAY THE US AND USSR RELY ON NUCLEAR WEAPON TECHNOLOGY TO ACCOMPLISH THEIR NATIONAL OBJECTIVES. AS A CONSEQUENCE OF THESE DIFFERENCES, ANY BAN ON NUCLEAR TESTING OR ANY THRESHOLD ON TESTING WILL AFFECT THE SECURITY OF THE TWO SOCIETIES IN DIFFERENT WAYS. AS THE PARTY WHICH HAS HISTORICALLY RELIED MOST ON THE CUTTING EDGE OF TECHNOLOGY TO ACCOMPLISH ITS GOALS, AMERICAN INTEREST WILL BE MUCH MORE ADVERSELY IMPACTED THAN THOSE OF THE SOVIET UNION. THUS, AS LONG AS WE ARE OBLIGATED TO RELY ON THE RETALIATORY CAPABILITIES OF OUR NUCLEAR WEAPONS TO SECURE DETERRENCE, NUCLEAR TESTING AND A STRONG DETERRENT POSTURE WILL REMAIN INSEPARABLE. CONSEQUENTLY, EVEN IF VERIFICATION WERE NOT A CONCERN--AND IT IS--AN EXTENSION OF THE NUCLEAR BAN TEST REGIME AT THIS TIME WOULD NOT SERVE OUR NATIONAL SECURITY INTEREST.

CONCLUSION

LET ME SUMMARIZE BY SAYING THAT THE DOE PROGRAM HAS RESPONDED HEROICALLY TO THE INCREASED REQUIREMENTS OF THE LAST FEW YEARS, BUT I FEEL THAT WE ARE OPERATING WITH A HIGHER LEVEL OF RISK THAN I AM COMFORTABLE WITH. THE ONE-TRACK PRODUCTION

SYSTEM IS BEING STRAINED, WITH LITTLE BACKUP, AND AGING FACILITIES AND EQUIPMENT STILL NEED MODERNIZATION. THE AVAILABILITY OF SPECIAL NUCLEAR MATERIAL, PARTICULARLY REACTOR PRODUCTS, IS *DELETED* VULNERABLE BOTH POLITICALLY AND TECHNICALLY, AND NO RESPONSIVE RESERVE CAPACITY EXISTS. IN THE AREA OF RD&T THE PRESENT FUNDING REQUEST SUPPORTS THE DOE SDI ACTIVITY AND PREVENTS FURTHER EROSION OF THE BASE NUCLEAR WEAPONS PROGRAM, AND BOTH ARE ESSENTIAL, ESPECIALLY IN LIGHT OF BOTH WHAT WE DO KNOW AND WHAT WE DON'T KNOW ABOUT THE SOVIET PROGRAM.

(U) THIS YEAR'S DOE BUDGET REQUEST, IF FULLY APPROVED, IS BARELY ADEQUATE TO SUPPORT THE NUCLEAR WEAPONS PROGRAM, AND THUS DESERVES THIS COMMITTEE'S FULLEST SUPPORT. BECAUSE OF THE MARGINALITY OF THE PROGRAM, I BELIEVE WE MUST LOOK FARTHER IN THE FUTURE. THERE ARE MANY CONSIDERATIONS, BUT LET ME NARROW DOWN TO TWO CONCRETE ITEMS.

(U) IN THE AREA OF RESEARCH AND DEVELOPMENT, THE DOD/DOE LONG RANGE RESOURCE PLANNING GROUP (STARBIRD STUDY) RECOMMENDED, IN 1980, A FIFTEEN PERCENT INCREASE IN R&D MANPOWER FROM 7400 IN 1980 TO 8500. PROGRESS IN ACHIEVING THIS OBJECTIVE IS CONTINUING, REACHING 8150 IN 1985, AND PLANNED TO REACH 8400 IN 1986. HOWEVER, THE STARBIRD STUDY DID NOT ANTICIPATE THE INCEPTION OF A NEW PROGRAM, THE PRESIDENT'S STRATEGIC DEFENSE INITIATIVE (SDI), IN WHICH THE DEPARTMENT OF ENERGY HAS A SIGNIFICANT ROLE WHICH CONSTITUTES AN UNFORESEEN EXPANSION OF ITS ONGOING RESPONSIBILITIES. IN ORDER FOR DOE TO SUPPORT THIS ESSENTIAL ACTIVITY, THE LEVEL OF EFFORT IN THE CORE PROGRAM HAS ACTUALLY DECREASED IN THE LAST FEW YEARS; THIS LOSS DIRECTLY IMPACTS THE DOD BY REDUCING DEVELOPMENT ACTIVITIES FOR OUR FUTURE WEAPON SYSTEMS. THEREFORE, I FEEL THAT THE STARBIRD STUDY MANPOWER GOAL OF 8500, TO BE CONSISTENT WITH THE

INITIATION OF SDI, SHOULD BE INCREASED SUBSTANTIALLY, PERHAPS TO AROUND 9500 IN ORDER TO MAINTAIN PROPER ATTENTION TO THE CORE PROGRAM. I MIGHT NOTE THAT, FOR COMPARISON, SINCE THE LATE 1970'S, THE INCREASE IN THE CORRESPONDING DOD NUCLEAR WEAPON RDT&E HAS BEEN NEARLY TWICE THE INCREASE IN THE DOE DEFENSE PROGRAMS RD&T. FINALLY, I BELIEVE THAT, TO BEGIN TO BUILD A RESILIENT POSITION FOR PLUTONIUM AND TRITIUM PRODUCTION, AN ISOTOPE SEPARATION CAPABILITY MUST BE PUT IN PLACE AS SOON AS POSSIBLE.

(U) THAT CONCLUDES MY FORMAL TESTIMONY. THE MILITARY LIAISON COMMITTEE MEMBERS, REPRESENTING THEIR MILITARY DEPARTMENTS, AND I WOULD BE HAPPY TO ANSWER QUESTIONS.

STRATEGIC DEFENSE INITIATIVE

STATEMENT OF LT. GEN. JAMES A. ABRAHAMSON, U.S. AIR FORCE, DIRECTOR, STRATEGIC DEFENSE INITIATIVE ORGANIZATION

Chairman HATFIELD. General Abrahamson.

General ABRAHAMSON. Sir, this is the first time that I have been before you, Mr. Chairman, and this committee.

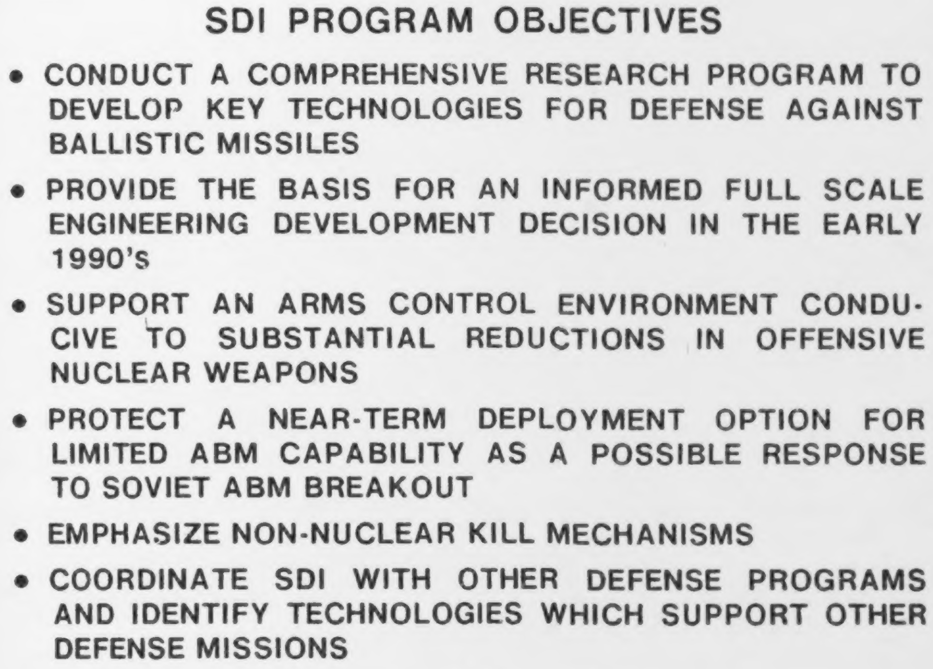
Chairman HATFIELD. In fact, you have a western connection, don't you?

General ABRAHAMSON. Yes, sir; I do. I grew up in Oregon and helped plant some of the forests in our areas.

Chairman HATFIELD. That makes you extra welcome here.

General ABRAHAMSON. Thank you, sir. I have, of course, an unclassified version of my statement for the record. I don't think that it is valuable at this point to go back over that.

Chairman HATFIELD. General, let me interrupt at this point. I hope that as many of these questions that we will submit to all of you for the record can be answered in unclassified material or information.



SDI PROGRAM OBJECTIVES

- CONDUCT A COMPREHENSIVE RESEARCH PROGRAM TO DEVELOP KEY TECHNOLOGIES FOR DEFENSE AGAINST BALLISTIC MISSILES
- PROVIDE THE BASIS FOR AN INFORMED FULL SCALE ENGINEERING DEVELOPMENT DECISION IN THE EARLY 1990's
- SUPPORT AN ARMS CONTROL ENVIRONMENT CONDUCIVE TO SUBSTANTIAL REDUCTIONS IN OFFENSIVE NUCLEAR WEAPONS
- PROTECT A NEAR-TERM DEPLOYMENT OPTION FOR LIMITED ABM CAPABILITY AS A POSSIBLE RESPONSE TO SOVIET ABM BREAKOUT
- EMPHASIZE NON-NUCLEAR KILL MECHANISMS
- COORDINATE SDI WITH OTHER DEFENSE PROGRAMS AND IDENTIFY TECHNOLOGIES WHICH SUPPORT OTHER DEFENSE MISSIONS

OBJECTIVES OF SDI PROGRAM

General ABRAHAMSON. For several of the other members of the committee and for many of the staff people, I have talked before about program objectives and I guess I would only like to emphasize just about two items on this chart.

No. 1, SDI is a research program being conducted in full compliance with the ABM Treaty. The direction given the program is to facilitate a development decision in the early 1990's. Hopefully, between now and then the SDI Program can support an arms control environment wherein we can begin to reduce nuclear weapons immediately and not wait until a development decision is made.

We have tried to build a strategy into our arms control negotiations to assist us in that direction. Part of that strategy was my presenting a program last June to the Soviets and answering their questions about the SDI Program. The intent was to try to lay out officially to them what we are doing and why we consider our SDI efforts to be peaceful and, in fact, more stabilizing.

The area that we get into a lot of difficulty with is this nonnuclear kill mechanism. I am sure this committee is concerned because there is a nonnuclear emphasis on the program. That is our clear objective—whether it makes sense to continue to do some kind of SDI-related nuclear testing in the face of this emphasis.

I believe the answer really lies in a broader question than just strategic defense. I believe that that lies in the fact that we are now developing a third generation of nuclear weapons. They are no longer only merely explosive devices, like the first generation which was, of course, the original version of the fission bomb, the second generation being the hydrogen bomb, and the third generation being one where the bomb pumps a device and causes very, very selective destruction somewhere else. In light of the evolution of these weapons, we need to determine the threat of the third generation to our offensive forces today, as well as any strategic defense we might build in the future.

Senator JOHNSTON. May I interrupt to ask, does that nuclear-directed, energy weapon violate the weapon-in-space clause of the ABM treaties?

General ABRAHAMSON. Obviously, it would depend on how one deployed such a thing. By the way, the first related space treaty was the UN Outerspace Treaty. It said that any weapon of mass destruction could not be deployed in space. Actually, it was broader, although it is my understanding that that definition is generally accepted to be a nuclear weapon.

The various architectures that we are looking at are the kinds where you would use a popup system and keep them on the ground until needed or until an appropriate time in a flight structure.

That is not always easy. We are looking at what that means and what those could be. But we are looking at it not only from our viewpoint, but also from the Soviet viewpoint if they had those kinds of systems and put them either in space or on the ground.

Senator JOHNSTON. If you had it orbiting, would it or would it not violate the ABM in your view?

General ABRAHAMSON. It is not the ABM Treaty that we are talking about here.

Senator JOHNSTON. It is the UN Treaty?

General ABRAHAMSON. We are talking about the Outerspace Treaty. The ABM Treaty says, and actually—I am sorry, I said that incorrectly. If there is any deployment of mobile systems to counter ICBM's, that would be a violation of the ABM Treaty. It wouldn't be merely because it was nuclear.

Senator JOHNSTON. The Outerspace Treaty says, "Weapon of mass destruction."

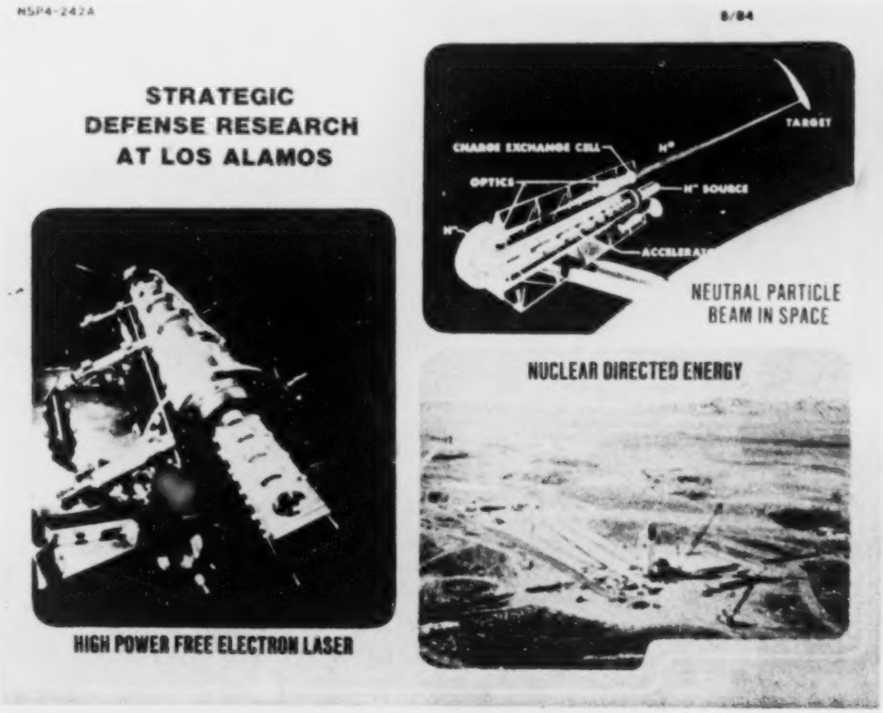
General ABRAHAMSON. The Outerspace Treaty says that we will not place a weapon of mass destruction in space.

Senator JOHNSTON. This would not violate that?

General ABRAHAMSON. Whether it applies to ABM purposes or other purposes, offensive purposes.

Senator JOHNSTON. And this direct-energy weapon would not violate the Outerspace Treaty in your view?

General ABRAHAMSON. So long as it were not based in space. If it were based in space, it would; yes, sir.


NSP4-242A
8/84
STRATEGIC DEFENSE RESEARCH AT LOS ALAMOS
TARGET
CHARGE EXCHANGE CELL
H⁰
OPTICS
H⁻ SOURCE
H⁻
ACCELERAT
NEUTRAL PARTICLE BEAM IN SPACE
NUCLEAR DIRECTED ENERGY
HIGH POWER FREE ELECTRON LASER

SDI WORK AT THE NATIONAL LABORATORIES

General ABRAHAMSON. I would like to highlight some of the kinds of work that we do with the various national laboratories. I think the key point here—and it has already been made—is that the scientists and the technical people at our national laboratories are really some of our best and most creative people in this country, not only in the areas of nuclear weapons, but in many, many areas that are related to these efforts.

Therefore, they are a valuable team for us. For example, at Los Alamos they are doing work on nuclear-directed energy and their specialty is a device called, [deleted].

So that is one of their main systems that Los Alamos is looking at. They are also looking at a concept which I will let Lieutenant Colonel Davis explain to you because I want you to see it in the context of what the Russians have done earlier; then it will make more sense.

Senator JOHNSTON. Do you think the [deleted] would bust the mylar balloons?

General ABRAHAMSON. Yes; there is no question about that.

Senator JOHNSTON. That is what you want them to do? You want to break the balloons rather than agitate them?

General ABRAHAMSON. Yes, sir; and be able to tell the difference.

This is the nuclear-directed energy program and, while there are some things such as certain kinds of effects and support which we could fund with Department of Defense funds, I would like to point out that the legal interpretation of the Atomic Energy Act is that warhead development should be funded by the Department of Energy. Therefore, there are funds included in the proposal by the Department of Energy.

Now, as opposed to that, there are scientific areas such as neutral particle beam [NPB] generators that are funded on a reimbursable basis by DOD. The NPB generator is a very large atomic accelerator that would go into space.

Again, the people at Los Alamos, who are the experts in this area, are doing the research on the NPB. That research, however, is being done on a reimbursable basis and does not appear in the Department of Energy budget. This is money that SDIO can send over on a reimbursable basis to use their scientists on development effort.

Chairman HATFIELD. General, if I may interrupt, and I apologize, we have a very few seconds left on a vote. We are going to have to delay for just a few moments. Is there a dash or a period that you are coming to in your response to Senator Johnston's question?

General ABRAHAMSON. Perhaps here, the best place is go right to the budget. You can see that there are funds that are projected——

Chairman HATFIELD. Excuse me. Let us make a pause here, because if we start on the budget, we will miss the vote.

General ABRAHAMSON. All right, sir.

Chairman HATFIELD. We will be right back.

PREPARED QUESTIONS SUBMITTED BY SENATOR MCLURE

Senator MCCLURE. Mr. Chairman, before leaving, I have a number of questions to submit for the record and, unfortunately, I can't stay for the balance of the hearing, but I would like to have those questions included in the record.

Chairman HATFIELD. They will be presented to the panel and to Admiral McKee. Senator Johnston and I will be back very shortly.

[Whereupon, a short recess was taken.]

[The questions and answers follow:]

QUESTIONS SUBMITTED BY SENATOR McCLURE

Special Isotope Separation

Question: The Administration did not request funding for the SIS facility in the FY 1986 budget, so I am very pleased to see the Department provides for the option of deployment of this technology "at some future date" in the FY 1987 request. Has the Department of Defense and the National Security Council indicated their support for the SIS facility?

Answer: Both the Department of Defense (DOD) and the National Security Council have indicated their support for a Special Isotope Separation (SIS) production facility. DOD has strengthened the program by making available $35 million within the 050 account for the Department of Energy FY 1987 SIS budget.

Question: The FY 1987 budget request for the Special Isotope Separation Facility is $74,900,000 for research and development and provides an option for deployment of the technology. How much of this funding will be directed towards the deployment of the technology and how much is slated for research and development activities. Has the Department established a date when it would expect to begin deployment of the SIS?

Answer: At present, all of the funding is being directed toward further development of the process. However, should it be decided that the line-item project be continued during FY 1987, a portion of this funding would need to be reprogrammed. The precise amount will depend upon the relative pace of the design and development tasks.

It is anticipated that definitive design will begin during FY 1986. Decisions on future construction activities will depend on future assessments of need, technical progress, and funding availability.

Question: Last year, this Committee appropriated $4,000,000 for design and engineering for the SIS, with the provision that DOE conduct a 120 day process readiness review of the competing SIS processes. This review was to select the process most likely for technical success and have the lowest operating and capital costs, and, if the panel agreed that a technology was ready for plant scale implementation, design of the project could commence using the selected technology. Has this Congressionally-mandated panel completed its review? If so, when can this committee expect to receive the results of the review? What are the Department's plans regarding initiating the project design work?

Answer: The review team submitted the final report to the Department on March 28, 1986.

'e results of the review are being made available to the committee.

The Department has considered the results of the process readiness review and has decided that design can begin based on the Atomic Vapor Laser Isotope Separation process. This work is expected to commence in July 1986.

Question: What does DOE project as the total funding requirements for design, construction and operation of the SIS? Will DOD share the cost of this facility?

Answer: A complete engineering estimate of costs will be completed in June 1986 as part of the Conceptual Design Report. Preconceptual estimates indicate that the total project cost, including line-item construction and related operating expenditures, will total $577 million, of which $31 million has been appropriated in prior years. Development costs, including FY 1987 through completion, are estimated to be $143 million. Once in production, the plant will require about $55 million per year for operating expenses.

The Department of Defense has provided $35 million in FY 1987 funding within the 050 account to keep open the option of continuing line-item funding.

Question: Has the Department selected a site for the SIS facility? If the answer to #6 is yes, please explain to the Committee the procedure by which the site was selected. If the answer to #6 is no, please describe the steps that DOE will take to chose a site. Has DOE a tentative date when this Committee could expect an announcement of the site selection to be made?

Answer: No, a site for the SIS facility has not been selected. The final selection of a site must await the completion of appropriate National Environmental Policy Act documentation. The Department of Energy intends to complete an Environmental Impact Statement as part of the site selection process and prior to the start of construction. In the interim, design will continue based on a preferred site, which will be identified during FY 1986 based on an internal review of candidate sites.

Should it be decided to construct the Special Isotope Separation production facility, completion of the environmental impact statement and designation of a site would be accomplished during FY 1988.

Question: Funds provided for activities needed to replace several hundred reactor process tubes in the N Reactor indicate DOE intends to continue operating the N Reactor into the mid-1990's. What is the total projected cost of repairs needed to extend the life of the N Reactor?

Answer: N Reactor life extension can be tailored to meet a range of production complex requirements. If no improvements are made beyond the current programs for facility restoration, environmental upgrades and productivity retention, the economic end life for N Reactor would occur in the early to middle 1990's. The tube replacement funding requested is a continuation of current routine maintenance and surveillance activities to assure safe and economic operation through that time. That work, in conjunction with flux flattening and a continuation of modest "balance of plant" improvements, can prolong N Reactor life to about the year 2000. The total cost of these activities over this period, considering both operating and capital funds would be approximately $370 million.

Question: Did the Department conduct any cost/benefit studies before making the decision to repair the N Reactor rather than construct a new or replacement production reactor? If so, please provide the committee with the resulting information.

Answer: No cost/benefit study was conducted on repair activities needed to assure continued operation of N Reactor through this decade since these are normal maintenance and improvement activities of a magnitude similar to that historically required to support continued reactor operation. Extension of N Reactor life beyond approximately 2000 is expected to require major refurbishment of the graphite stack and replacement of all the process tubes. This will require major capital funding and will not be undertaken without appropriate cost/benefit studies.

Question: Funding is requested for the operation of four production reactors at the Savannah River Plant (P, K, C, and L). In October 1985, a deep crack was discovered in the C Reactor. There was some concern within the Department that it might not be possible to repair the crack, and studies looking into the severity and the cause of the crack were conducted. Subsequently, repair was begun. What was the cause of the crack and the extent of the damage to the reactor vessel? What is the status of the repair on the crack and what is the cost to date? Does the FY 1987 budget request include funds to continue and complete the repair of the C Reactor, and if so, how much is the request?

Answer: The crack in the C Reactor tank is believed to have been caused by intergranular stress corrosion resulting from the simultaneous presence of sensitized stainless steel (due to initial tank fabrication methods), tensile stress, and an aggressive environment. The other reactor tanks at the Savannah River Plant were fabricated differently and, therefore, are not subject to this problem. The sensitized steel was extensively inspected and all defects were conservatively characterized as cracks. These defects, ranging from about one to eleven inches in length, were grouped in four locations of the sensitized stainless steel.

Minor leaks in the containment tank of the C Reactor at the Savannah River Plant were detected during the last production cycle which ended last June. The leak was not a safety concern because of the low pressure and low operating temperature of the tank. A program to examine and repair the reactor tank was initiated by DuPont, with the assistance of Westinghouse Electric Corporation. A detailed ultrasonic inspection of the region of sensitized stainless steel in the tank resulted in the decision to weld four patches in the tank. All analyses concerning the effects of operating with patches in the tank have shown that the reactor can continue to operate for many more years with no incremental safety or operating concerns. Initial attempts to weld the first patch were unsuccessful due to unexpected characteristics of the metal in the tank. Further repairs are on hold until the properties of the metal are characterized. This repair has cost about $38.6 million in subcontracts to Westinghouse Electric Corporation and has also caused us to defer lower priority activities.

The FY 1987 budget includes no funds specifically earmarked for repair of the C Reactor.

Question: What effort has the Department made to determine if the problem with the C Reactor could or has occurred in one or more of the other production reactors at Savannah River?

Answer: C Reactor is the only reactor at the Savannah River Plant which incorporates sensitized stainless steel in the region between the tank wall and the tank bottom. The tank wall in the other reactors is welded directly to the tank bottom. All inspections to date have identified no defects in the other reactor tanks.

Question: In past years, after several assessment panels had determined the lifetime of the present Savannah River reactors was unpredictable, and that a new reactor should be built and operating sometime in the 1990's, a considerable amount of funding was provided DOE for a new production reactor. What is the status of this project? What funds has DOE requested for this facility in FY 1987.

Answer: Since the earlier assessments were made, the results of ongoing surveillance and life extension studies on the existing production reactors have indicated the feasibility of continuous operation of these reactors at least into the next century with no major capital expenditures beyond that historically required to maintain reactor operation. Therefore, a decision to deploy a new production reactor, NPR, has been deferred for several years. In FY 1985, $3.0 million was expended for the New Production Reactor for preconceptual design activities. In FY 1986, $6.1 million was budgeted for completion of the NPR activities including evaluations of smaller concepts. There are no funds included in the FY 1987 budget for the NPR program.

Funding for Environmental Problems

Question: It appears to me that the FY 1987 budget request from Defense Programs is slated to address a number of environmental problems at DOE facilities that have received considerable adverse publicity in recent years. What is the total amount of funding requested by defense programs that will be devoted to environmental cleanup and concerns?

Answer: Defense Programs is requesting $551 million in the FY 1987 budget to address environment, safety, and health problems. Not all of the requested budget funds will be used for environmental cleanup activities. Some will be used to bring DOE facilities into compliance with environmental regulations and ensure worker health and safety.

Question: What provisions has DOE made to internally monitor for and correct environmental problems, before they become a matter of public alarm?

Answer: DOE continually monitors its ES&H activities through appraisals, standards development, epidemiology, contractual language and other techniques. The industrial practices of the DOE production complex compare with the practices of the private sector. The problems that have surfaced at our sites reflect the change in regulations and is similar to the experiences of the private sector. Correcting our environmental problems requires budgeting, planning, and characterizing the problems in order to find out if the technology exists to rectify the problem, or bring the facility into compliance. Defense Programs initiated the development of long-range 5-year plans encompassing the environment, safety, and health aspects of our activities a few years ago.

Further, the Secretary of Energy has issued new initiatives to strengthen the functions of the Office of the Assistant Secretary for Environment, Safety and Health (ASEH). A new Office of Audit and Compliance has been established with the primary responsibility to conduct an environmental survey of DOE facilities and to develop a strategy with the Program Secretarial Officers to bring the facilities into compliance. We are working closely with the ASEH and staff to characterize better our DOE environmental problems, to keep the EPA, States and public informed of our actions in this area and to avoid undue public concern.

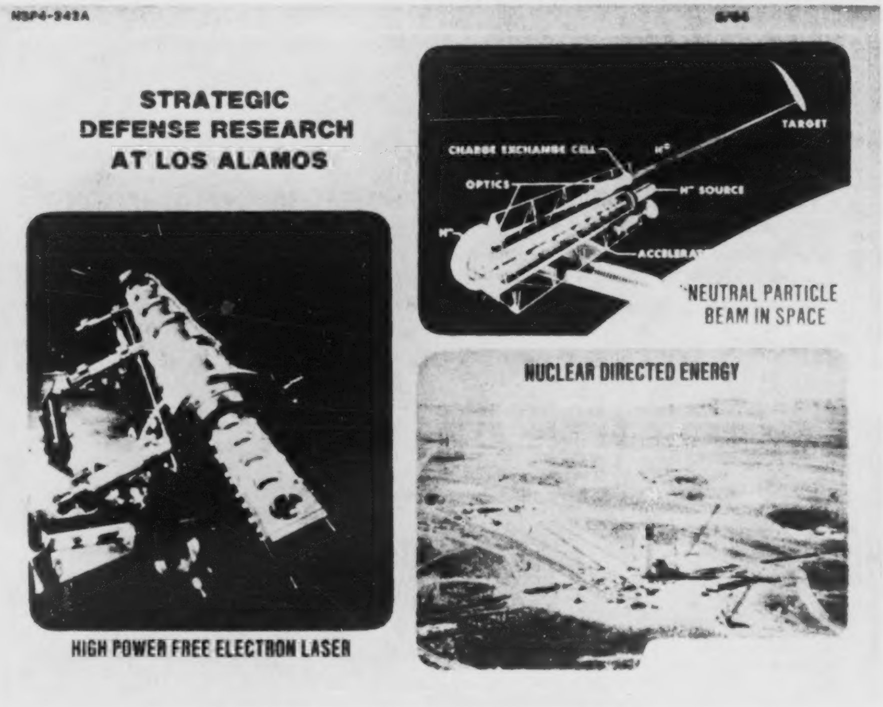
Chairman HATFIELD. The hearing will come to order.

All right, General Abrahamson, will you please continue your presentation.

Senator JOHNSTON. May I ask you one thing about the slide you had up there?

General ABRAHAMSON. Sure.

Senator JOHNSTON. The neutral particle beam, what is it? What do you envision as the power source for that?



STRATEGIC DEFENSE RESEARCH AT LOS ALAMOS

NEUTRAL PARTICLE BEAM IN SPACE

NUCLEAR DIRECTED ENERGY

HIGH POWER FREE ELECTRON LASER

TARGET
CHARGE EXCHANGE CELL
H^0
OPTICS
H^- SOURCE
H^-
ACCELERA

General ABRAHAMSON. There are several possible power sources. It will take a large amount of power. Right now we have an operating version of this called White Horse, but it is an experimental version that is in a laboratory.

It uses some very, very large radio frequency generators and electrical power that is available to the base. In a space application of such a weapon, we would have to be able to have probably an SP–100 or even a multimegawatt type of system.

Senator JOHNSTON. SP–100 is what?

General ABRAHAMSON. SP–100 is a nuclear reactor that we are developing jointly with the Department of Energy.

Senator JOHNSTON. How many megawatts?

General ABRAHAMSON. Well, we think it can burst—it is still a little unknown, but we are aiming for going up to 300 kilowatts, sir. That is enough to be able to have a high level of average power but it is not enough to conduct a [deleted].

Senator JOHNSTON. You need multimegawatts for that.

General ABRAHAMSON. You really need multimegawatts. So, since it can only be used for just a few minutes in any one particular orbit, you either store that energy mechanically, with capacitors, or some other device. If multimegawatt power comes along quickly, then we would like to be able to use that. But right now, multimegawatt power is downstream quite a ways. So we are looking at various energy storage devices to combine with the lower average power SP–100.

Senator JOHNSTON. Do you think the SP–100 would work with storage?

General ABRAHAMSON. Yes, sir; otherwise, I wouldn't be putting SDI money into it.

Senator JOHNSTON. How heavy would SP–100 be?

General ABRAHAMSON. For a 300-kilowatt SP–100 reactor, we are estimating a weight of 8,000 kilograms.

Senator JOHNSTON. It is a big thing, isn't it?

General ABRAHAMSON. Oh, yes, sir. At this point, our estimate is maybe two shuttle loads in terms of size and volume, not in weight, but it is a very large device.

I want to emphasize that these are things that are in the DOD budget or in the DOE budget; if they are in the DOD budget they are reimbursable and the money comes through that payback route to obtain the use of the very fine talent at Los Alamos.

Senator JOHNSTON. How about free electron laser? It takes the same order of magnitude of power of neutral particle beams, doesn't it?

General ABRAHAMSON. Yes, sir; it is a very high powered device.

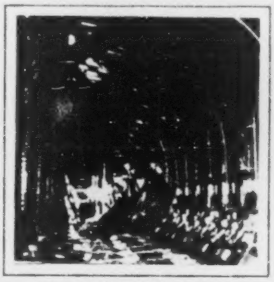
Senator JOHNSTON. There is no advantage in one over the other as far as power?

General ABRAHAMSON. They are very different, but not in terms of power.

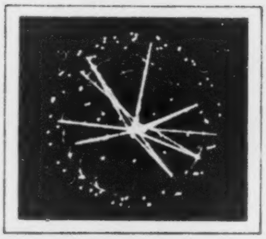
Senator JOHNSTON. Electricity.

General ABRAHAMSON. It is significant. They are both fairly low efficiency devices. It is a little unknown how far it can come out, but perhaps less than 10-percent efficiency.

TECHNOLOGIES RELEVANT TO STRATEGIC DEFENSE



Charged Particle Beams



Systems Analysis for SDI

General ABRAHAMSON. Now in contrast to that, here are some of the programs at the Lawrence Livermore Laboratory. Once again, you can see the various kinds of activities that are reimbursable or not reimbursable.

Nuclear-directed energy research is an area, of course, that has become controversial. The x-ray laser, a third-generation nuclear weapon, was first seen in the Soviet literature quite early. Lt. Col. Rich Davis will give you some evidence of what we know about Soviet efforts in x-ray laser technology.

The concept of the x-ray laser is to use a nuclear explosion to get very hard radiation out quickly and then in just a few nanoseconds you cause a lasing material to lase when it is exposed to that radiation. It gives out a big pulse of laser energy that can be directed to boosters as they are coming out of the upper atmosphere. By the way, it can't penetrate the surface or the atmosphere at all.

Senator JOHNSTON. You have had experiments on this [deleted].

General ABRAHAMSON. [Deleted.]

Examples of some SDI reimbursable programs include the system analysis work done at Livermore, Sandia, and Los Alamos.

The free electron laser, which is the induction linac version, has made great progress. Based on its success, not only in an integrated experiment but also in components, we are going ahead with the ground-based free electron laser as the primary and what we believe will be the first of our large laser systems, or directed-energy systems, that might be useful for SDI in the future.

NATIONAL LABORATORY FUNDING FOR SDI SUPPORT

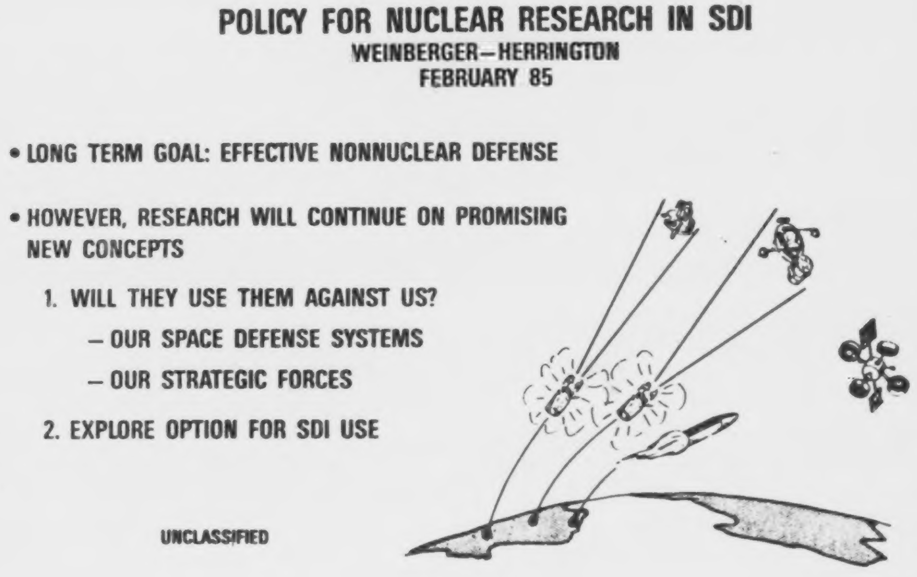
	FY 1984	FY 1985	FY 1986
DEPARTMENT OF ENERGY	$118	$215	$270
DOD/SDI REIMBURSABLE FUNDS	$45	$118	$240*

*ESTIMATED

SDI FUNDING AT THE NATIONAL LABORATORIES

General ABRAHAMSON. To get an understanding of the order of magnitude of moneys. This is an estimate. If you would like to comment on it, please do, but I think it is a good estimate, but it varies slightly as you go through the year.

Here you can see the comparison in terms of the amount of reimbursable funding that we are putting back into those laboratories. Primarily, those three—Sandia, Livermore, and Los Alamos.



POLICY FOR NUCLEAR RESEARCH IN SDI

WEINBERGER–HERRINGTON
FEBRUARY 85

- LONG TERM GOAL: EFFECTIVE NONNUCLEAR DEFENSE
- HOWEVER, RESEARCH WILL CONTINUE ON PROMISING NEW CONCEPTS
  1. WILL THEY USE THEM AGAINST US?
     - OUR SPACE DEFENSE SYSTEMS
     - OUR STRATEGIC FORCES
  2. EXPLORE OPTION FOR SDI USE

UNCLASSIFIED

SDI POLICY

General ABRAHAMSON. This slide emphasizes the policy of doing nuclear research. I think it is a logical policy. It is the same policy that drives us, on the one hand, to build lasers, and on the other hand to experiment with laser armor. If it were quite clear that laser armor could be built and would not be effective, then it would be wrong for me or foolish for me to come forward with a recommendation that the laser would be the right weapon to destroy a ballistic missile.

The same thing here. If third-generation weapons are beginning to be effective or could be in the future, we need to see if they could use them against us for our space defense systems, for other space systems, or our strategic warning system, or could they be used against our strategic forces in a Soviet version of SDI?

Obviously, if you are examining that you just naturally take a look at it in terms of, can it be used for our system and would it be of some significant advantage?

That does not take away from the objective that the President has laid out. He has said, "Let's see if we can make this nonnuclear." The large majority of the money is going into trying to make it nonnuclear.

However, obviously, we are not trying to do it in a closed mind fashion. We are trying to look at it to see if there are those advantages.

NUCLEAR-DIRECTED ENERGY WEAPONS

The only thing that I would like to say is that there are really several basic areas of tests. I talked to you briefly about the x-ray laser. [Deleted.]

The hypervelocity pellet is the one that I mentioned at Los Alamos which is in the same category, and then we are doing work in the microwaves, particle beams, and an optical laser [deleted].

That is the one that I would like to have Lieutenant Colonel Davis talk to you about. I think this, at least, gives you some understanding of a generalized schedule where we are trying to be able to be in a position to say, "Could they use these effectively against us?" or "Could we, or should we, employ them in an SDI system?"

Senator JOHNSTON. May I ask about the hypervelocity pellets?

General ABRAHAMSON. [Deleted.]

Senator JOHNSTON. Why would you use the nuclear weapon? [Deleted.]

General ABRAHAMSON. Yes, sir. [Deleted.]

Senator JOHNSTON. Then the dust looks kind of like the shotgun effect.

General ABRAHAMSON. Yes, sir; the right way to think about it is that it is a shotgun.

Senator JOHNSTON. So it covers a big area?

General ABRAHAMSON. That still depends on how effective we can make this. [Deleted.]

Senator JOHNSTON. Thank you.

Chairman HATFIELD. Does that complete your statement?

General ABRAHAMSON. I would like to introduce Lieutenant Colonel Davis. I would like him to give you at least what we know about the Soviet side of the equivalent of the programs which I think would be valuable.

SOVIET CAPABILITIES

Colonel DAVIS. Sir, at the request of General Abrahamson, a small intelligence working group was formed with representatives from the DOE national laboratories, the Defense Intelligence Agency, CIA, and the SDI Office. With the caveat that all intelligence [deleted].

[Deleted.]

Chairman HATFIELD. Thank you very much.

[The statement follows:]

STATEMENT OF LT. GEN. JAMES A. ABRAHAMSON

MR.CHAIRMAN IT IS A PLEASURE TO APPEAR BEFORE THE COMMITTEE TO DISCUSS WITH YOU THE STRATEGIC DEFENSE INITIATIVE (SDI) AND THE IMPORTANCE OF THE DEPARTMENT OF ENERGY'S (DOE) ROLE IN THE SDI RESEARCH PROGRAM. THREE YEARS AGO PRESIDENT REAGAN EXPRESSED THE CONVICTION THAT FREE PEOPLE SHOULD LIVE SECURE IN THE KNOWLEDGE THAT THEIR SECURITY DID NOT REST UPON THE THREAT OF RETALIATION TO DETER A SOVIET NUCLEAR ATTACK. AT THAT TIME HE DESCRIBED THE THREAT POSED BY INCREASING SOVIET NUCLEAR ARSENALS, AND HE PROPOSED BOLD STEPS, EMBODIED IN A NEW INITIATIVE, TO ADDRESS THAT THREAT. THIS INITIATIVE CALLED FOR A COMPREHENSIVE AND INTENSIVE RESEARCH PROGRAM TO PURSUE THE ADVANCES IN TECHNOLOGY THAT HAVE THE POTENTIAL FOR STRENGTHENING DETERRENCE BY INTRODUCING A DEFENSIVE COMPONENT TO OUR DETERRENT POSTURE.

THE GOAL OF THE SDI IS TO CONDUCT A VIGOROUS PROGRAM OF RESEARCH ON EMERGING TECHNOLOGIES IN SEARCH OF A BETTER BASIS FOR A CREDIBLE DETERRENCE AND STRENGTHEN THE STABILITY OF PEACE THROUGH STRATEGIC DEFENSE. WE ENVISION THAT SUCH A PURSUIT WILL OFFER INCENTIVES TO THE SOVIET UNION TO JOIN WITH US TO REDUCE SIGNIFICANTLY OR EVEN ELIMINATE BALLISTIC MISSILE FORCES. THE DOE IS HELPING US SUPPORT THIS GOAL IN TWO BASIC WAYS.

FIRST, THERE IS REIMBURSABLE SUPPORT TO DOE LABORATORIES FOR PERFORMING DIRECT SDIO MISSION ORIENTED WORK. EXAMPLES OF THIS WOULD BE THE RESEARCH ON THE FREE ELECTRON LASER (FEL) CONDUCTED AT THE LAWRENCE LIVERMORE NATIONAL LABORATORY AND THE NEUTRAL PARTICLE BEAM EXPERIMENTS AT THE LOS ALAMOS NATIONAL LABORATORY. THE SECOND CATEGORY IS A DOE-FUNDED SUPPORT THAT FALLS WITHIN ITS CLASSIC ROLE OF NUCLEAR WEAPONS RESEARCH.

THE PRESIDENT HAS MADE IT CLEAR THAT HIS GOAL IS FOR SDIO TO INVESTIGATE A DEFENSIVE SYSTEM BASED LARGELY ON NON-NUCLEAR

TECHNOLOGY. THE FACT THAT SDIO IS SUPPORTING SOME MODERATE LEVEL OF EFFORT IN A NUCLEAR PROGRAM MAY AT FIRST APPEAR AS A PARADOX. IT IS NOT, AND I WILL CLEARLY EXPLAIN OUR NEED FOR DOE WORK AND KNOW-HOW LATER IN MY TESTIMONY. FIRST, HOWEVER, LET ME DEFINE THE SDI MISSION.

THE MISSION GIVEN TO ME BY PRESIDENT REAGAN WAS TO PROVIDE BY THE EARLY 1990's THE DATA BASE REQUIRED TO MAKE AN INFORMED DECISION, ON THE TECHNICAL FEASIBILITY OF DEPLOYING A BALLISTIC MISSILE DEFENSE SYSTEM, THAT COULD ENHANCE THE SECURITY OF BOTH THE UNITED STATES AND HER ALLIES. FOR SUCH A DEFENSE SYSTEM TO BE USEABLE, IT MUST CONFORM TO RATHER STRINGENT STANDARDS. IT MUST BE SURVIVABLE, ROBUST, AND COST-EFFECTIVE-AT-THE-MARGIN. SUFFICE IT TO SAY SURVIVABILITY IS VERY HIGH ON OUR AGENDA. TO DEVELOP SURVIVABLE SYSTEMS ONE MUST HAVE A REALISTIC GRASP OF POSSIBLE SOVIET RESPONSES OR COUNTERMEASURES TO ANY BALLISTIC MISSILE DEFENSE SYSTEM WE MIGHT DEPLOY. TO ADDRESS THIS, SDI HAS SET UP, THROUGH ITS COUNTERMEASURES OFFICE, TWO TYPES OF SO-CALLED "RED TEAMS". A SET OF TECHNICAL RED TEAMS ARE USED TO CHALLENGE THE DESIGNS OF SPECIFIC DEVICES OR SYSTEMS, SUCH AS THE BOOST-PHASE SENSOR AND TRACK SYSTEM (BSTS). THE BLUE TEAM DOING THE ACTUAL DESIGN MUST THEN RESPOND TO THIS POSTULATED, YET TECHNICALLY REALISTIC SOVIET COUNTEMEASURE. ANOTHER TYPE OF RED TEAM IS A "SOVIET" RED TEAM. IT WOULD TAKE US FAR AFIELD OF TODAY'S AGENDA TO GO INTO DETAIL ABOUT THE SPECIFICS OF HOW THESE RED TEAMS OPERATE AND IMPACT SDI SYSTEM DESIGNS AND ARCHITECTURES. WHAT IS IMPORTANT FOR TODAY'S HEARING IS THAT ANY SOVIET SYSTEM CAPABLE OF DESTROYING OR SEVERLY DEGRADING A U.S.BALLISTIC MISSILE DEFENSE SYSTEM MUST BE STUDIED VERY CAREFULLY AND IN GREAT TECHNICAL DETAIL. THE NUCLEAR DIRECTED ENERGY CONCEPTS IN GENERAL AND THE X-RAY LASER IN PARTICULAR, AS A COUNTER DEFENSIVE THREAT, FALLS SQUARELY INTO THIS CATEGORY.

THE SOVIETS HAVE BASICALLY THREE POSSIBLE RESPONSES TO OVERCOME A BALLISTIC MISSILE DEFENSE SYSTEM AND THEREFORE TRY TO ASSURE THE MILITARY OBJECTIVES OF A FIRST STRIKE ATTACK. THEY COULD TRY TO OVERWHELM OR SATURATE OUR DEFENSE BY BUILDING A WHOLE NEW FLEET OF FAST BURNING MISSILES, PROBABLY AT VERY GREAT COST. THEY COULD ATTEMPT TO DECOY OUR DEFENSIVE SYSTEM SO THAT WE COULD NOT EASILY FIND THEIR REAL RV's. THIS CAN BE COUNTERED BY USE OF INTERACTIVE DISCRIMINATION SCHEMES SUCH AS NEUTRAL PARTICLE BEAMS, AND/OR X-RAY LASERS, AND KINETIC ENERGY METHODS. FINALLY, THE MOST COST-EFFECTIVE METHOD, AT LEAST TO INITIATE A STRIKE, WOULD BE TO DIRECTLY ATTACK OUR DEFENSIVE SPACE-BASED ASSETS.

WITH THESE FACTORS IN MIND, ONE CAN MORE EASILY UNDERSTAND THE ROLE THAT NUCLEAR RESEARCH PLAYS IN BALLISTIC MISSILE DEFENSE. THESE REASONS HAVE BEEN OUTLINED JOINTLY BY SECRETARY WEINBERGER AND SECRETARY HERRINGTON AND ARE STATED BELOW.

1. TO DETERMINE THE FEASIBILITY AND EFFECTIVENESS OF COUNTERDEFENSIVE NUCLEAR-DRIVEN SYSTEMS THAT AN ADVERSARY MAY DEVELOP FOR USE AGAINST FUTURE U.S. SURVEILLANCE AND DEFENSIVE SYSTEMS.

2. TO UNDERSTAND THE TECHNICAL FEASIBILITY AND IMPACT THAT SUCH CONCEPTS MIGHT HAVE ON OUR DETERRENT FORCES IF UTILIZED IN SOVIET DEFENSIVE SYSTEMS.

3. TO EXPLORE NUCLEAR DIRECTED ENERGY OPTIONS AS BALLISTIC MISSILE DEFENSE POSSIBILITIES IF NEEDED.

ONE SHOULD RECOGNIZE THAT SDI IS A PROGRAM THAT IS FULLY COMPLIANT WITH THE VARIOUS TREATIES (INCLUDING THE 1972 ABM TREATY ENTERED INTO BY THE UNITED STATES AND THE SOVIET UNION).

HOWEVER, THE PRESIDENT HAS DIRECTED THAT THE PROGRAM EMPHASIZE NON-NUCLEAR DEFENSIVE SYSTEMS. CLEARLY, THE SOVIETS ARE UNDER NO SUCH CONSTRAINT ABOUT PURSUING SUCH RESEARCH, OR USING NUCLEAR WEAPONS OR NUCLEAR DIRECTED ENERGY WEAPONS (NDEWs) IN THEIR DEFENSE SYSTEMS. THE CURRENT ANTIBALLISTIC MISSILE (ABM) SYSTEM NOW DEPLOYED AROUND MOSCOW USES NUCLEAR WARHEADS. THE SOVIETS HAVE DONE RESEARCH ON NDEW -- SOME EARLIER THAN OUR OWN. BECAUSE OF THIS, A PARTICULARLY IMPORTANT ASPECT OF OUR RESEARCH ON NDEW IS TO UNDERSTAND ITS FEASBILITY IN COUNTERING UNITED STATES RETALIATORY FORCES, AND IN A COUNTERDEFENSIVE MODE AS IT MIGHT BE USED BY THE SOVIETS TO DESTROY SPACE-BASED ELEMENTS OF UNITED STATES SURVEILLANCE SYSTEMS AND A FUTURE UNITED STATES STRATEGIC DEFENSE SYSTEM.

ALSO, NDEWs MAY BE USEFUL AS PART OF A FUTURE BALLISTIC MISSILE DEFENSE SYSTEM. A NDEW WOULD USE A NUCLEAR EXPLOSION TO POWER NARROW, INTENSE BEAMS OF ENERGY IN SELECTED DIRECTIONS TO DESTROY ATTACKING MISSILES OR REENTRY VEHICLES AT DISTANCES HUNDREDS OR THOUSANDS OF MILES IN SPACE. IN CONTRAST TO THE APPROACHES OF SOME EARLY ABM SYSTEM DESIGNS, WHICH USED TRADITIONAL NUCLEAR WEAPONS, THERE WOULD BE FAR FEWER EXPLOSIONS AND THEY WOULD BE IN SPACE, SO THAT WE WOULD EXPECT NO DAMAGE TO PEOPLE OR STRUCTURES ON THE GROUND. A NDEW MIGHT BE GROUND-BASED AND POPPED UP INTO SPACE AS NEEDED RATHER THAN BASED IN SPACE.

IN SUMMARY, THE SDI RESEARCH PROGRAM HAS ALWAYS CONTAINED EFFORTS CARRIED OUT JOINTLY BY THE DEPARTMENT OF DEFENSE AND THE DEPARTMENT OF ENERGY TO EXPLORE THE TECHNICAL FEASIBILITY OF NDEW. IN THE PAST, FUNDING FOR NDEW HAS BEEN APPROXIMATELY 10-15 PERCENT OF THE TOTAL SDI BUDGET. DOD AND DOE ARE SEEKING INCREASED FUNDING FOR NDEW RESEARCH, BUT THIS WILL NOT EXCEED THE USUAL PORPORTION, SINCE THE ADMINISTRATION IS ALSO SEEKING FUNDING TO INCREASE THE OVERALL SDI RESEARCH.

THE SDIO REQUESTS THAT CONGRESS CONTINUE TO SUPPORT THE DOE REQUESTS TO ALLOW THE COMPLETION OF CRITICAL FEASIBILITY TESTS IN TIME TO IMPACT OUR DECISION TIME FRAME.

AS PART OF THIS SUPPORT, I REQUEST THAT THE CONGRESS ASSIST US IN PROVIDING A FUNDS TRANSFER BETWEEN SDIO AND DOE TO ALLOW US TO HAVE CONSISTENT RESEARCH MILESTONES. A DISCUSSION OF THIS SPECIFIC ISSUE IS PROVIDED IN APPENDIX A.

APPENDIX A

RECENTLY, THE PRESIDENT TRANSMITTED A MESSAGE TO CONGRESS PROPOSING THE TRANSFER OF $62 MILLION FROM THE DEPARTMENT OF DEFENSE TO THE DEPARTMENT OF ENERGY IN FISCAL YEAR 1986 TO ACCELERATE RESEARCH ON NUCLEAR DIRECTED ENERGY CONCEPTS. THE PURPOSE OF THE LETTER WAS TO EMPHASIZE THE URGENCY OF THIS PROPOSED ACTION, PROVIDE SUPPORTING INFORMATION, AND REQUEST YOUR ASSISTANCE IN EFFECTING THIS FUNDING TRANSFER.

IN THE PAST SEVERAL MONTHS, OUR KNOWLEDGE AND UNDERSTANDING OF NUCLEAR DIRECTED ENERGY TECHNOLOGY HAS ADVANCED SIGNIFICANTLY. THIS KNOWLEDGE HAS INCREASED THE IMPORTANCE OF THE NUCLEAR DIRECTED ENERGY RESEARCH TO THE NATIONAL STRATEGIC DEFENSE INITIATIVE PROGRAM. OUR NEW UNDERSTANDING IS A RESULT OF THE SIGNIFICANT PROGRESS MADE IN THE NUCLEAR DIRECTED ENERGY TECHNOLOGY AND THE RESULTS OF SDI ARCHITECTURE STUDIES WHICH SHOWED THE DRAMATIC IMPACT, ESPECIALLY IN THE THREAT AREA, THAT AN ADVERSARY'S NUCLEAR DIRECTED ENERGY WEAPON (NDEW) COULD HAVE ON NATIONAL SECURITY. IT IS VITAL THAT THE DEPARTMENT OF ENERGY'S LEVEL OF EFFORT ON SDI RESEARCH BE INCREASED DURING FISCAL YEAR 1986 AND BEYOND SO THAT THE FEASIBILITY AND SIGNIFICANCE OF THIS TECHNOLOGY, PARTICULARLY THE POTENTIAL THREAT IT POSES IF DEVELOPED BY THE SOVIETS, CAN BE PROPERLY

CONSIDERED IN FUTURE STRATEGIC DEFENSE INITIATIVE PROGRAMMATIC DECISIONS. IT IS ESSENTIAL THAT THIS TECHNOLOGY BE SYNCHRONIZED WITH THE EXPECTED MATURATION OF SDI TECHNOLOGY DEVELOPMENTS. OTHERWISE, PROGRAMMATIC DECISIONS WILL BE BASED ON AN INADEQUATE UNDERSTANDING OF NUCLEAR DIRECTED ENERGY FEASIBILITY.

TO KEEP PACE WITH SDI TECHNOLOGY DEVELOPMENT, THE $62 MILLION TO BE TRANSFERRED TO THE DEPARTMENT OF ENERGY WILL BE USED TO ACCELERATE NDEW RESEARCH TO DETERMINE THE TECHNICAL FEASIBILITY AND THE PERFORMANCE PARAMETERS OF NDEW CONCEPTS. THIS DETERMINATION WILL PROVIDE DATA AND EXPERIMENTAL CAPABILITY TO THE DEPARTMENT OF DEFENSE TO ASSESS SOVIET DEFENSIVE AND COUNTER-DEFENSIVE THREAT CAPABILITY AS SOON AS POSSIBLE, BUT NO LATER THAN THE EARLY 1990's -- A DATE AT WHICH WE BELIEVE MANY CRITICAL SDI TECHNOLOGIES WILL BE COMING TO MATURITY. THIS INFORMATION IS CRITICAL TO THE ARCHITECTURE OF A POTENTIAL UNITED STATES STRATEGIC DEFENSE SYSTEM.

TO AVOID ANY INCREASE IN THE FEDERAL DEFICIT, THE DEPARTMENT OF DEFENSE IS MAKING $62 MILLION AVAILABLE FROM WITHIN THEIR OVERALL FISCAL YEAR 1986 SDI BUDGET OF $2,759 BILLION. I WOULD APPRECIATE YOUR PROMPT CONSIDERATION AND APPROVAL OF THE PRESIDENT'S REQUEST.

SDI AS A NONNUCLEAR OPTION

Chairman HATFIELD. Gentlemen, thank you very much again for a very eloquent presentation.

Senator Johnston, do you have any questions you wish to ask?

Senator JOHNSTON. I don't think so, Mr. Chairman. Thank you.

Chairman HATFIELD. All right.

Senator Cochran.

Senator COCHRAN. Mr. Chairman, just an observation. When I first was one of those that decided to support the President's initiative and appropriate the funds for the SDI and began discussing this decision with constituents, one of the most appealing aspects of it from a political standpoint was that it was a nonnuclear program.

The fact that we are now seeing the effort made to develop the nuclear-directed weapons and do research in this effort makes it a tougher sell from a political standpoint for those of us who are trying to defend the program and defend the President's efforts in this area.

I don't know that there is anything that can be done about it. I am not saying that that means that we ought to stop supporting the program or that I am going to stop supporting the program, but it makes it a lot more difficult and that just ought to be recognized.

I think we are going to put a great deal more effort in the explaining of this, the education process, so that it is understood that we are not talking about the nuclear weapons that explode in the conventional way and create the fallout and nuclear winter and all the rest and that we are escalating the nuclear weapons programs into outerspace.

It is just very frightening. It is very frightening to the people of this country, and younger people, particularly, who were beginning to be excited about an alternative to the traditional nuclear arms race.

This puts it back into the category of a traditional nuclear arms race in some minds and it has to be worked on if you are going to keep getting support from the Congress for the program.

Senator JOHNSTON. May I ask a question?

Chairman HATFIELD. Senator Johnston.

Senator JOHNSTON. General, how would you rate your candidates for possible development in the early 1990's? I understand that the ground-based laser is the best candidate at this time?

EIRS PROGRAM

General ABRAHAMSON. No, sir. Actually, there are simpler candidates which are such things as some of the mechanical kill devices. If you recall, back in 1984, remember, we intercepted a missile with a nonnuclear device which was, of course, ideal, and what we would like to do—we demonstrated the feasibility of that concept then.

Since that time we have embarked on now bringing that system down, making it very small and making it very inexpensive. In fact, the cost goal for each of those is less than $1 million per round. Obviously, we can't produce even a nuclear weapon at that kind of a price.

That is called the EIRS Program. It can't exist by itself. It has to have a command and control system and it has to have a means by dealing with decoys. But in terms of the weapon, that is probably one of the very early area systems that could provide protection to populations. It would not be just a simple terminal system that would defend our missile fields, for example, alone.

Senator JOHNSTON. These would be shot from the orbiting satellite?

General ABRAHAMSON. No, sir; they would be shot from the ground. Now there is an equivalent of that which we are making very fine progress on and this is, again, a similar interceptor. However, it is now based in space.

The one that is based in space can allow you to get at the boost phase which we consider to be so critical.

So, if I were going to rate the two weapons that would be the earliest of all, I would rate those two more standard kinds of systems which are clearly nonnuclear and, again, sir, I echo that point.

I agree with you wholeheartedly. After that——

Senator JOHNSTON. Those are kinetic energy systems?

General ABRAHAMSON. That's right; those are two kinetic energy devices.

Senator JOHNSTON. One fired from the ground and one from orbit?

General ABRAHAMSON. That is correct.

Senator JOHNSTON. You would have to have the orbiting for the boost phase?

General ABRAHAMSON. Yes, sir.

Senator JOHNSTON. Do you have a fast-burning rocket on the——

General ABRAHAMSON. On the ground one; yes, sir.

Senator JOHNSTON. Is that the EIRS Program, ground based?

General ABRAHAMSON. Yes, sir; EIRS, which has been awarded to Lockheed Corp. now as a single contract. It is an experimental vehicle just like everything else is in the program.

Senator JOHNSTON. Can they reach out to intermediate phase?

General ABRAHAMSON. Right now, most of the work is not being done on the rocket. Most of the work is being done on how to bring the cost down for the interceptor itself.

However, with fairly standard rocket technology, we believe that even just one site in the North Central United States could cover most of the North American Continent.

I am not sure that is the best deployment scheme, but that gives you a feel for how fast you can get out and cover a very, very large distance.

Senator JOHNSTON. Thank you.

Chairman HATFIELD. Thank you, Senator Johnston.

FISCAL YEAR 1986 SUPPLEMENTAL FOR SDI

Chairman HATFIELD. General Abrahamson, there is another matter that I would like to raise at this point.

That is the matter of the supplemental request—General Davis and Admiral Foley, it probably involves all of you, for SDI.

General Davis, I believe in your testimony you indicated that the need to augment the DOE request for SDI—and I am talking now about the supplemental at the expense of decrementing, if that is the correct pronunciation of that word; I like that word—an already finely honed DOD request.

Both Senator Stevens and I have requested a list of those activities or items within DOD that would be reduced by $62 million, the figure in the supplemental, and provide the funds for the DOE.

Could you provide us with some of the detail of those activities or those reductions that would offset the $62 million?

General ABRAHAMSON. Sir, all of the $62 million is within the Department of Defense SDI Program. Now, the unfortunate part that makes it difficult to respond specifically to what you have asked is the fact that we had a $1 billion reduction in the overall program last year. In absorbing this reduction, we could see that there was a need to supplement and accelerate the DOE portion of SDI-related activities.

Chairman HATFIELD. Does this affect universities or laboratories, for instance?

General ABRAHAMSON. Well, it affects all parts of the program. I took out a very large sum of money and it is a piece of that; I have difficulty accurately telling you about it. If I had that $62 million back, I would not put it back exactly in the original areas because by now a substantial amount of the year has expired and new priorities have evolved.

I believe, from your viewpoint, that the important point is that all of the $62 million is out of the SDI Program. We have not taken it from any other Department of Defense line item.

Chairman HATFIELD. As you know, under Gramm-Rudman we may be required to offset these moneys that are represented by increases in DOE.

General Davis, your statement would also indicate that $4 million of the supplemental request would be used for the Strategic Defense Facility; is that correct? And is this the Sandia lab that you are talking about?

General DAVIS. Yes.

Chairman HATFIELD. This raises two other possible problems for us. One is, as you may recall, last October the Congress and the President agreed to a level of funding to provide only $2 million in DOE fiscal year 1986 for this project.

I suppose, first of all, I would have to ask why the additional money is required, and then to raise the question that in the authorization for this project by the Armed Services Committee that the additional $4 million would exceed that ceiling for fiscal year 1986.

This committee, not this subcommittee, but the Appropriations Committee, and the Defense Subcommittee particularly, is always having to navigate through rocky shoals to avoid the jurisdictional questions that arise between the authorizing committee and the Defense Subcommittee on Appropriations.

We are engaged, really, in sort of an informal negotiation at the moment between these two committees and this would be one of those items, I am sure, that the Armed Services Committee would be quick to point out that we on the Appropriations Committee have exceeded that ceiling that they set.

That seems to be the crux of this intercommittee difficulty we are experiencing. Now, if you would like to submit this for the record, you may do so, but I raise those questions. If you would like to submit that for the record, we would appreciate it.

General DAVIS. Yes, sir; that will be fine.

Chairman HATFIELD. You see my point. Have I made my question clear to you?

General DAVIS. Yes, sir; absolutely.

[The information follows:]

SDI TRANSFER

The prepared testimony states that, "The DOD Strategic Defense Initiative Office has thus far provided $38 million to the DOE to reimbursably fund SDI research in direct support of DOD mission responsibilities. * * * The $38 million supports efforts directed in DOD's mission areas. * * * $4 million will be used for the Strategic Defenses Facility, as required by last year's authorization language. * * *

The fiscal year 1986 Department of Defense Authorization Act conference report authorized $4 million to be appropriated to the Department of Energy for fiscal year 1986 for Project 86-D-104, Strategic Defenses Facility, Sandia National Laboratories, Albuquerque, NM. In addition,the conference report stated:

"The conferees agree to authorize $8 million to begin this facility, with $4 million from amounts authorized for Department of Energy defense programs and $4 million from funds authorized for the Strategic Defense Initiative in accordance with the letter dated June 20, 1985, from the Director, Strategic Defense Initiative Organization, to the Deputy Assistant Secretary of Energy. The conferees expect that the $83.8 million total cost of this facility will be shared in some equitable way between the Department of Energy and the SDIO."

Therefore, the $4 million provided by DOD, in addition to the $2 million appropriated by this subcommittee, does not exceed the $8 million authorization ceiling. None of the $62 million appropriation transfer would be used for the Strategic Defenses Facility.

Chairman HATFIELD. Admiral Foley, could I ask you one last question. In the supplemental, you have some moneys that you are requesting for SDI-related testing, but for tests that would not occur until the fiscal year 1987 budget year.

Mr. FOLEY. Yes, sir.

Chairman HATFIELD. I believe you indicated that it would be difficult to add to your current testing schedule and there is a complexity about all of that.

Then do I understand that the requested supplemental funding for testing would relate to personnel, equipment, and material to be used for tests in 1987?

REQUIREMENT FOR SUPPLEMENTAL FUNDING

Mr. Foley. Yes, sir; it is for tests in 1987. It would be for acquiring the personnel. We have to round up the right people since they are not readily available. It would be for personnel and for some long leadtime items, for general preparation and study leading up to the test in 1987.

I think it would be appropriate though, and let me make one comment on the overall supplemental request that we have made.

I came into the job fully realizing the priorities of General Abrahamson. We support the SDI Program entirely, but it has to pay its own way. It doesn't come out of tech base, for example. This is a dynamic R&D program. As the General said, this looks better and we need to accelerate here and we need to do that. I support that entirely.

But how do we get the money or where do we get the money to do that? We can't take it out of the R&D tech base in DOE and finance that. That is part of the reason for the supplemental. I support it 100 percent, but you have to pay for it and now you figure out a way to get the money on over to us in DOE. That is the fundamental reason.

Chairman Hatfield. Maybe he has money over there to transfer to you.

General Abrahamson. I always like it when the Navy is helping us.

Mr. Foley. But only about 15 percent of the overall SDI is in the nuclear side, so it is fundamentally a nonnuclear program.

Chairman Hatfield. My rather extraordinary and well-founded comments and commendatory comments about the Navy, I do not want the Air Force or the Army to feel that we are less appreciative of the part you play in supporting the Navy in the Defense Department. [Laughter.]

PREPARED QUESTIONS SUBMITTED FOR THE RECORD

As I indicated earlier, we have a series of detailed questions for your response.

[The questions and answers follow:]

QUESTIONS SUBMITTED BY CHAIRMAN HATFIELD

Compliance with Threshold Treaty

Question: On Soviet compliance with the Threshold Test Ban Treaty of 1974, there apparently is some disagreement within the Administration on whether there is evidence of Soviet violations. Dr. Roger Batzel, the Director of Lawrence Livermore National Laboratory, stated a few weeks ago that "we have concluded that the Soviets appear to be observing a yield limit. Our best estimate of this yield limit is consistent with the threshold test ban treaty." Admiral Foley, would you agree with this assessment?

Answer: The assessment has to be kept in its proper context. Dr. Batzel was referring to yield estimates based on the interpretation of seismic signals alone. We have consistently noted very large uncertainties involved in such seismic estimates of Soviet test yields.

DELETED

Such data may be consistent with compliance, but they are also consistent with very substantial noncompliance. This is a simple example, but it is a fair representation of what we actually see. We see tests that could be in compliance, but nevertheless appear based on the best estimate to be out of compliance. Dr. Batzel noted in his own testimony that we cannot rule out the possibility of some violations. Furthermore, Administration findings have been based on the totality of seismic and non-seismic evidence. Given the full weight of evidence, and given the very large uncertainties that we must still recognize, we support fully the Administration's finding of likely Threshold Test Ban Treaty violations on the part of the Soviet Union.

Question: Assistant Secretary of Defense Perle stated in an interview on March 24, 1986, that "I've looked carefully at the evidence and have concluded. . . that there is significant evidence the Soviets have violated the 150-kiloton threshold." Admiral Foley, have you seen any such evidence?

Answer: Yes, with the understanding that all our evidence is beset with the kinds of uncertainties that we have constantly pointed out. There have been several instances in which our best estimates of Soviet yields have exceeded the 150-kiloton limit. Because of the uncertainties in yield estimation we are not prepared to say positively that they actually were violations; it is for that reason that the President has used the term "likely violations" of the Threshold Test Ban Treaty.

Question: Mr. Perle seems to imply that the U.S. should consider breaking the 150-kiloton limit which both sides have been observing. What is your view on our continued compliance with the unratified treaty?

Answer: The Department of Energy's weapons development program is dictated by the military needs that have been spelled out by the Defense Department. At the present time we do not have identified military needs that would dictate tests above the 150 kiloton limit. Whether that will continue to be the case in the future, we do not know. Mr. Perle's comments would have to be addressed in that context.

Comprehensive Test Ban

Question: Earlier this month, a 23 member American panel including James R. Schlesinger, former Secretary of Defense and Director of CIA; General Brent Scowcroft, the national security advisor in the Ford Administration; and Warren Christopher, a former Deputy Secretary of State agreed that the U.S. and USSR should negotiate a comprehensive test ban and that this halt in testing would curb nuclear proliferation to other countries. Do you agree with this group? Would a mutual ban stop or slow down the nuclear arms race?

Answer: With respect to so-called "horizontal" proliferation, a U.S.-Soviet Comprehensive Test Ban under present conditions would not necessarily constitute a brake on the plans or intentions of potential nuclear states. Whether to "go nuclear" is a decision of highest national security importance for various states, and ultimately depends on a variety of underlying circumstances--regional tensions, desire for enhanced political influence or prestige, and concern about activities of neighbors--that would not be significantly changed by a Comprehensive Test Ban. Nor would a third part adherence to a Comprehensive Test Ban prevent such a nation from designing a reliable first-generation weapon; as you know, the device dropped on Hiroshima had not been tested. Whether, in such circumstances, individual states would feel that their security required them to develop national nuclear capabilities is a question which cannot be answered in the abstract. It seems clear, however, that any decrease in credibility of the U.S. nuclear deterrent would lead other countries to carefully reassess their national security calculations. In that context their adoption of national options cannot be excluded.

Question: Please give your views on the problems with implementing an immediate mutual ban in all testing between the U.S. and USSR.

Answer: First, for the reasons that have been amply discussed, we would oppose such a ban at this time. We do not believe that at present such a ban would be in the security interests of the United States; so long as we continue to rely on a nuclear deterrent, we must continue to test nuclear weapons. When the time comes for such a ban, implementation would be a subject for considerable negotiation. Historically, the most serious area of contention has been the Soviet reluctance to permit onsite inspection of questionable events. Recently, they have indicated in public statements that they are now less hostile to such inspection, but whether that would be reflected in actual negotiations, we do not know.

Verification

Question: What steps could the two countries agree on in order to provide adequate verification on a Comprehensive Test Ban?

Answer: It is not certain what steps will be required in detail to provide adequate verification on a comprehensive test ban prior to negotiations and discussions with the Soviet Union.

Question: William J. Hannon, the manager of seismic monitoring research at Lawrence Livermore, indicates that a network of 15 seismic stations placed in the Soviet Union would be able to detect - with 90 percent reliability - explosions of as little as 3 kilotons, even if they were muffled in a large cavity. Other seismologists have estimated that even smaller explosions could be reliably detected. Do you disagree with these experts?

Answer: We believe that Dr. Hannon's work included an additional 15 stations on the borders of the USSR and only referred to seismic magnitudes vice yields. We can neither agree nor disagree with this since we do not have the experience of either in-country stations or stations within regional distances DELETED There are many technical issues as yet resolved which inhibit our capability to estimate detection capabilities.

Question: I understand that the Soviets have indicated a willingness to agree to on-site inspections and tamper-proof seismic monitoring devices - would this provide adequate verification?

Answer: Their willingness is the first important step in the process of establishing a system for effectively monitoring a comprehensive test ban in the USSR. There would have to be meaningful provisions for actually implementing such a system, however.

Question: Would agreement on something like our CORRTEX system at their test site combined with additional U.S. seismic monitors provide adequate verification.

Answer: Apparently you are speaking in the context of improved verification of the Threshold Test Ban Treaty. We believe that CORRTEX would considerably improve our ability to estimate the yields of Soviet tests and, for that reason, it would constitute an important step toward provision of adequate and effective verification. We have proposed to the Soviets that we work together toward the utilization of CORRTEX for that purpose, but have not received a favorable response. CORRTEX is a yield estimation device, and thus would be of no use in verification of a comprehensive test ban; you cannot very well measure the yield of a device that the other side claims does not exist.

Question: Assistant Secretary of Defense Perle also stated "...even if a test ban were verifiable, it's not in our interest to stop (testing)." Do you agree with this statement?

Answer: Yes. As long as our security and the security of our Allies relies on a credible and effective nuclear deterrent, nuclear testing will be required.

Other Testing Limitations

Question: Some nuclear testing analysts advocate lowering the 150 kiloton threshold to about 5 kilotons or lower. Could this type of proposal be verified adequately? Are there insurmountable problems with this proposal?

Answer: In the verification context, adequate is not well defined, but lowering the threshold to 5 kiloton would make seismic monitoring technically much more difficult.

DELETED

difficult because of the frequency of occurrence of earthquakes at this seismic magnitude, and because of the signal to background noise ratios. In addition, at the 5 kiloton level, the Soviets would have many more opportunities to test in dry alluvium or other absorptive sediments, or in decoupled cavities.

We are concerned with the movement toward a comprehensive test ban represented by a lowered threshold. As stated elsewhere, we do not believe a comprehensive test ban to be in the best interest of the U.S. as long as we need a nuclear deterrent. Accordingly, steps in that direction are seen as opposing our best interests.

Question: Another group, the Council on Foreign Relations, has proposed an annual quota on the number of tests on both sides, say 5 each, every year. Is this proposal a viable idea?

Answer: No. In the first place, the number of nuclear tests conducted by the United States should be determined by our national defense needs, not by some arbitrary limit. Such a low, arbitrary limit would impose even more severe prioritization than already exists in the test program and might result in serious neglect or delay in addressing critical nuclear weapons issues. In the second place, a limit on test numbers would be impossible to verify, e.g., we would not be able to detect and identify all low yield explosions. It would not be difficult for the Soviets to conduct several nuclear explosions simultaneously and in the same locale that would appear to be a single explosion.

Purpose of Testing

Question: Why is there a need to continue testing? Please list the major purposes or reasons for these tests.

Answer: Nuclear testing is required to ensure the continued credibility and effectiveness of our nuclear deterrent forces. Nuclear tests are conducted that have a variety of specific purposes but all with this basic goal in mind. Tests are conducted (1) to evaluate and maintain a confidence in the reliability of current stockpile weapons, (2) to develop and certify modern nuclear weapons to maintain a viable deterrent into the future, (3) to assess the vulnerability of United States military systems to nuclear weapon effects, (4) to maintain the skills and expertise of weapon scientists to deal with stockpile problems and last, but not least, (5) to explore promising new defensive technologies like directed energy weapons.

Question: How many DOE nuclear tests are proposed for FY 1986 and FY 1987?

Answer:

DELETED

Question: How many of the nuclear tests scheduled for FY 1986 and FY 1987 are tests whose primary purpose is stockpile confidence or reliability.

Answer:

DELETED

Question: Dr. Norris Bradbury, former Director of Los Alamos National Laboratory, and other experts recently stated in a letter to the House Foreign Affairs Committee that "continued testing is not necessary in order to insure the reliability of the nuclear weapons in our stockpile." Is testing absolutely necessary for reliability purposes? Why can't more routine surveillance activities provide adequate reliability? (disassembly and inspection of parts, detonation of the nonnuclear explosive triggers, and flash radiography)

Answer: Yes. Nuclear testing is indispensible to a credible and effective U.S. nuclear deterrent. We design our weapons for high reliability and employ virtually all relevant forms of testing to verify that reliability and assure there are no undiscovered problems. The surveillance activities you mention are conducted on a regular basis, but we have learned that they are not enough. They do not exercise the most important and least understood aspect of the weapon system namely, the operation of the nuclear device, itself. To leave out this key portion of our testing would greatly diminish confidence in our weapon systems and our deterrent's credibility.

Question: How many of the tests scheduled for FY 1986 and FY 1987 are related to SDI or directed energy either as a primary purpose, add-on experiment, physics experiment or secondary purpose?

Answer:

DELETED

Question: How many of the tests in FY 1986 and FY 1987 would relate directly to development and certification of new warhead designs or new weapons unrelated to the SDI effort? (Please provide a list of these tests, the warhead design, and weapon system)

Answer:

DELETED

Question: For the record, provide a table showing each test on directed energy weapons, particularly the x-ray laser which is planned for FY 1986, FY 1987, through 1991. Please include the size in kt, the cost of the test, the lead lab, the estimated time (quarter of yr.), and a brief description of the type of test and the need for each test.

Answer: The information requested for FY 1986 and FY 1987 is provided in the tables below. Our plans for tests for years beyond are not so specific or reliable, being paced by many factors, particularly, the actual technical results from near-term tests and the level of funding to support these efforts.

DELETED

DELETED

[1] Includes cumulative multiyear cost for each test representing field construction costs at the Nevada Test Site and estimates at the incremental cost accrued for each test by the Department of Energy weapon laboratories.

Question: How many 'weapon effects' tests are planned by any agency in FY 1986 and FY 1987?

Answer: In recent years, all tests whose primary purpose is the investigation of nuclear effects have been sponsored by the Department of Defense.

DELETED

Question: Dr. Orval Jones, the vice president for defense programs at Sandia National Laboratories, states that since the 1960's, a significant portion of our "weapons effects" testing has been taken over by large radiation simulators in the labs. (Machines that simulate radiation.) Please comment on the accuracy of this comment and briefly describe the importance of the Simulation Technology Laboratory at Sandia.

Answer: Laboratory radiation simulators are currently used to test weapon component parts (small objects a few inches in diameter) for effects of radiation. They do not have the power to test large components such as fire sets; weapon subsystems such as arming, fuzing, and fire assemblies; or full-sized weapon systems such as missiles, reentry vehicles, and satellites. Only underground tests can accomplish this mission. The simulators are mainly used in the engineering phase of weapon electronics components development and in preparation for testing these components underground. Structural materials response testing with few exceptions is done underground because simulators cannot provide proper radiation environments.

In the late 1960's, we only had simulators powerful enough to test small component parts at required radiation levels. Since then, simulation technology has evolved to the point where we can now envision and plan to build much larger simulators such as those planned for the Simulation Technology Laboratory. With these state-of-the-art simulators, we will be able to test large components and some subsystems to required radiation levels. However, underground testing will still be required for larger subsystems and the full weapon system. Full system tests will continue to be required because we cannot be sure of the survivability of the system until testing has been done with all of the subsystems in the container with the appropriate cabling connections made from subsystem to subsystem. Certain phenomena take place in the full system test that do not occur in individual subsystem tests. An example is system-generated electromagnetic pulse, an effect that is not predictable from calculations or above-ground testing of the subsystems.

Thus, we can presently use laboratory simulators to test up to weapon component sizes rather than the small component parts of the 1960's, and this is the basis for Dr. Jones' statement. The importance of the Simulation Technology Laboratory is that we can now test up to subsystem-sized objects in the laboratory before testing at Nevada.

Future Testing

Question: There was a very disturbing article in the New York Times on Monday. Dr. Robert Seldon of Los Alamos Laboratory indicated that it would require 100 or 200 tests to develop our SDI or directed energy weapons. Dr. John Hopkins, head of weapons technology at Los Alamos, was quoted as saying it would take "decades" of testing these 3rd-generation nuclear weapons. I believe that at our current testing pace, this number of tests would take 30 - 50 years or more to complete. Is this accurate?

Answer: DELETED

The William J. Broad article was indeed very disturbing. The interview was recorded by both Mr. Broad and the Los Alamos National Laboratory. The numbers 100 or 200 "tests" not "explosions" (the word used in the article) were used in an abstract discussion of the development of technology, using the number of tests to develop a new airplane as an example. No reference was made to increased nuclear testing in a Strategic Defense Initiative (SDI) (or any other) context. That number of nuclear tests to develop a new design has no precedent. It is not even in the ball park.

Question: The testing budget has already tripled between FY 80 and the FY 87 budget request. What are the long term projections -- will you request substantial increases in the number of tests and the funding for tests?

Answer: I do not envision a significant increase in the request for nuclear testing.

Question: Dr. Hans Bethe, a physicist and Nobel laureate, concludes that the prospect for third-generation weaponry is "the reason our government will not agree to a test ban." Do your agree that this is the primary reason for continued testing? (A major reason?)

Answer: No, to both questions. The reasons our government will not agree to a test ban at this time and the conditions under which one would be considered are clearly stated in a March 7, 1986, letter from President Reagan to the Senate Majority Leader, Senator Dole. "...because of the continuing threat that we face now and for the foreseeable future, the security of the United States, its friends and its allies must rely upon a credible and effective nuclear deterrent. A limited level of testing assures that our weapons are safe, effective, reliable and survivable and assures our capability to respond to the continued Soviet nuclear arms buildup. ..." In addition, survivability of other military assets in a nuclear environment must be assured and depends on testing.

Weapons Activities

Question: Excluding the impact of the ICF program, what is the proposed staffing of the R&D laboratories for FY 1984, FY 1985, FY 1986, and 1987?

Answer: Based on the requested funding and our set of assumptions which included 4.5 percent escalation from FY 1986 to FY 1987, we plan to attain a level of laboratory research and development employment of 9,150 full-time equivalents excluding Inertial Confinement Fusion. I would like to insert the following table for the record.

(The information follows.)

Total Full-Time Equivalents

	FY 1984	FY 1985	FY 1986	FY 1987
Los Alamos National Laboratory	1,980	1,991	1,927	2,463
Lawrence Livermore National Laboratory	2,469	2,473	2,449	2,848
Sandia National Laboratories	3,311	3,562	3,326	3,623
Other	150	213	208	216
Total	7,910	8,239	7,910	9,150

Question: What is included in the budget for the discretionary funding of the laboratory directors for FY 1985, FY 1986, and FY 1987? Please provide the source of funds for these discretionary accounts and the accomplishments to date. Please show this information by laboratory.

Answer: No specific funding is earmarked in the budget for the laboratory directors' discretionary use. Within the laboratories' available resources, they have the flexibility to allocate funds to be used to conduct exploratory research and development.

Exploratory R&D estimates are presented in the following table which I would like to insert into the record.

(The information follows:)

Funding for Exploratory Research and Development
($ in Millions)

	FY 1985	FY 1986	FY 1987
Lawrence Livermore National Laboratory	$14.0	$15.5	$15.5
Los Alamos National Laboratory	15.7	16.7	17.6
Sandia National Laboratories	5.9	7.1	9.3
Total	$35.6	$39.3	$42.4

The goals of this program are to: work in the forefront of science and technology, conduct studies of new hypotheses, and develop experimental devices, instruments, and components. These goals are being met by the program. Los Alamos National Laboratory's accomplishments include the development of technologies to utilize synchrotron sources for x-ray calibration of plasma diagnostic instrumentation. Applications of this work have been made to weapons diagnostics at the Nevada Test Site and have been transferred to both the Universities of Wisconsin and California at Berkeley for improvements of their accelerator facilities. Sandia National Laboratories accomplishments include advancing the knowledge of sensors which are potentially important for future smart weapons and the strategic defense initiative. An example of the Lawrence Livermore National Laboratory's accomplishments is the diamond turning machine technology development in support of precision engineering.

Question: Please provide a complete listing of expenditures from the discretionary account for FY 1985 for each laboratory.

Answer: The expenditures are presented in the following tables which I would like to insert into the record.

(The information follows:)

EXPLORATORY RESEARCH AND DEVELOPMENT PROGRAM
Lawrence Livermore National Laboratory
($ in Thousands)

Activity	FY 1985
Department (IR&D)	
Bio-Environmental	$ 98
Chemistry and Material Sciences	700
Computation	800
Earth Sciences	809
Engineering	894
Nuclear Chemistry	700
Physics	2,025
Subtotal	6,026
Director's Initiatives	
Bio-Environmental	602
Environmental Consequences (formerly Global Effects)	1,716
Institute for Geophysics and Planetary Research	706
Radiation Processing	-
Supercomputer Research	3,374
Subtotal	6,398
Lab-Wide Competitive Awards	1,569
Total Operating Expenses	$13,993

EXPLORATORY RESEARCH AND DEVELOPMENT PROGRAM
Los Alamos National Laboratory
($ in Thousands)

Activity	FY 1985
Information Processing	$ 182
Computer-Aided Engineering	779
Computer Technology	1,070
Theoretical and Computational Physics	1,434
Nuclear and Particle Physics	1,668
Material Sciences Condensed Matter	1,273
Chemistry	2,068
Atmospheric and Space Physics	327
Applied Projects Devices Techniques	2,717
Life Sciences and Biophysics	192
Theoretical and Applied Mechanics	1,174
Engineer Systems	2,608
National Security	208
Total Operating Expenses	$15,700

EXPLORATORY RESEARCH AND DEVELOPMENT PROGRAM
Sandia National Laboratories
($ in Thousands)

Activity	FY 1985
Development of artificial intelligence techniques for sensor-rich applications	$ 280
Processing of Materials with Lasers	111
Fluid-particle flows	196
Dynamic Metallization of Hydrogen	593
Transformation of toughened glass ceramics	169
Support of Imaging Sensor Development	607
DELETED	355
Study of the mechanism of bonding in dynamically compacts powders	123
SiGe Strained-layer Superlattices	353
Complementary Strained-layer Superlattice Logic	223
DELETED	261
Solid-state Switching	210
DELETED	69
Metallic Glass Coatings	143
Development of Sensors with Integrated Transducers and Processors	295
Combination analysis of Energetic Materials using Laser Probes and Computer Simulations	608
Optical Signal Processing: Target Recognition	518
Demonstration of Laser Chemical Processing on CRM Products	292
Laser Plasma Soft X-ray Source	527
Total Operating Expenses	$ 5,933

Question: What are the procedures for establishing the limit for the account and approving the expenditures?

Answer: Department of Energy Order 5000.1 states ". . . each R&D laboratory within the Department's laboratory system may. . .utilize a reasonable amount of operating funds for early exploration and exploitation of creative and innovative scientific and technological concepts arising in the course of the laboratory's work." The Order further states that cognizant secretarial officers have the responsibility to review and approve the level of exploratory research.

Question: Within the technology base, please provide the FY 1985, FY 1986, and FY 1987 funding for advanced concepts, supporting research, and supporting technologies.

Answer: The following table, which I would like to insert into the record, presents a breakout of the technology base effort.

(The information follows.)

WEAPONS TECHNOLOGY BASE
(B/A $ in Millions)

	FY 1985	FY 1986	FY 1987
Advanced Concepts	$237.9	$255.1	$437.6
Supporting Research	209.1	186.4	192.5
Supporting Technologies	265.2	238.9	249.9
Total	$712.2	$680.4	$880.0

Question: In terms of the number of units of new production, retirements, and modifications, what is the decrease or increase between FY 1986 and FY 1985 for each category and overall? For FY 1987 and FY 1986?

Answer: The new production, retirements, and modifications information is as follows:

	New Production			Retirements			Modifications/ Stockpile Improvement Plan		
	FY 85	FY 86	FY 87	FY 85	FY 86	FY 87	FY 85	FY 86	FY 87
Strategic Offensive									
Tactical					DELETED				
Fleet ASW and AAW									
Total									

Question: In terms of standard workload measurements, what is the percentage increase in production workload in FY 1986 over FY 1985? For FY 1987 and FY 1986?

Answer: As you know, subsequent to the Congressional submission, the Department of Energy and the Department of Defense agreed to DELETED accommodate Gramm-Rudman-Hollings spending reductions. These reductions are recovered beginning in FY 1989. These changes translate to decreases in equivalent workload of 5.9 percent from FY 1985 to FY 1986, and 5.2 percent from FY 1986 to FY 1987. While on the surface this would appear to argue for a decrease in the FY 1987 production and surveillance funding requirement, this is not the case. Given the lead times involved, the FY 1987 request is required to initiate the recovery of the Gramm-Rudman-Hollings driven reductions as well as conduct the necessary product/process engineering and tooling design to bring eight systems to first production DELETED This is, of course, in addition to meeting FY 1987 and FY 1988 delivery requirements.

Question: Please describe the activities being conducted and the funding level for the Marshall Islands in FY 1986 and FY 1987.

Answer: Current FY 1986 activities, funded at the level of $4.5 million, fall into four categories: medical, bioassay, environmental, and logistical support. The medical portion is designed to continue follow-up health care to the 174 members of the exposed population. This includes: (1) two annual ship-supported missions to Majuro, Ebeye, Utirik, and Mejato to examine and treat exposed and control populations; and (2) maintenance of a resident physician, nurse, and lab technician on Kwajalein for follow-up of the exposed population. The bioassay work is performed to verify dose predictions and to ensure that populations are within national and international radiation standards. This includes: (1) whole body counting for the resettled Enewetak population and the Bikinians who resided on Bikini in the 1970's; and (2) plutonium analysis of urine samples.

Environmental efforts focus on sampling the northern Marshalls environment, formulating dose assessments, and maintaining a radiological data base pertaining to the Marshalls. Included here are four ship-supported missions to Bikini to characterize the radiological conditions, to develop methods to reduce or block the uptake of radionuclides in the food chain, and to provide radiological advice relative to atoll resettlement. Lastly, the Department of Energy, through its field operations and support contractor, provide logistical support to the Marshall Islands programs including procurement, transportation, equipment maintenance, chartering of the medical ship, and establishing field camps on Enewetak and Bikini.

The breakdown of the $4.5 million funding for FY 1986 is as follows:

	($ in Millions)
Medical	$1.2
Bioassay	.5
Environmental	1.5
Logistical	1.3
Total	$4.5

FY 1987 activities and funding are more difficult to predict since the Department of Energy is assigned no direct responsibility in the Compact of Free Association legislation. However, we are prepared to continue activities for which we have the United States expertise--provided funding is made available by the Congress or on a reimbursable basis by another agency or the Government of the Marshall Islands.

Question: List how much is included in the FY 1984, 1985, 1986, and 1987 budget for State taxes. Please provide this by site and State.

Answer: I am pleased to provide the requested data.

(The information follows.)

State Taxes Estimates
(Includes Gross Receipts, Sales/Use, and Property Taxes)
($ in Thousands)

State/Site	FY 1984	FY 1985	FY 1986	FY 1987
Colorado				
Rocky Flats Plant	$ 2,398	$ 0	$ 2,750	$ 2,870
Missouri				
Kansas City Plant	(11)	3,475	2,888	2,943
New Mexico				
Sandia National Laboratories	12,173	13,049	14,376	17,013
Nevada				
Nevada Test Site	3,842	3,010	3,174	3,643
Ohio				
Mound Plant	161	2,800	500	600
California				
Lawrence Livermore National Laboratory	0	10	12	18
Total	$18,563	$22,344	$23,700	$27,087

Question: What rate of inflation was assumed in this appropriation in FY 1984, FY 1985, and FY 1986? Please provide the details that form the composite.

Answer: The inflation information you requested is shown in a table which I would like to insert in the record.

(The information follows.)

Fiscal Year Appropriation	% Operating Escalation	% Equipment Escalation	% Composite Escalation
1984	7.5%	7.5%	7.5%
1985	5.0%	5.0%	5.0%
1986	5.0%	5.0%	5.0%

Question: Provide a table showing the amounts for restoration, revitalization, and prevention of plant deterioration for FY 1984, FY 1985, FY 1986, and FY 1987. In the later category, include GPP, capital equipment, and operating expenses. Please provide this information by activity and location.

Answer: I would like to provide the following information for the record.

(The information follows:)

Weapons Activities
Summary of Restoration, Revitalization, and Prevention of Plant Deterioration
($ in Thousands) a/

	FY 1984 Actual	FY 1985 Actual	FY 1986 Estimate	FY 1987 Estimate
Research, Development, and Testing				
Lawrence Livermore National Laboratory				
Restoration	$ 15,500	$ 16,600	$ 17,500	$ 9,500
Revitalization	7,840	12,900	11,800	18,100
Prevention of Deterioration				
General Plant Projects	5,000	6,300	6,500	7,100
Basic Capital Equipment	19,090	21,650	15,733	18,000
Operating Expenses b/	43,083	54,407	58,422	61,343
Subtotal	90,513	111,857	109,955	114,043
Los Alamos National Laboratory				
Restoration	15,100	16,600	17,400	11,200
Revitalization	3,800	10,900	5,000	1,100
Prevention of Deterioration				
General Plant Projects	5,000	6,300	6,700	7,100
Basic Capital Equipment	16,867	20,880	15,561	23,850
Operating Expenses b/	56,466	61,610	66,529	69,855
Subtotal	97,233	116,290	111,190	113,105
Sandia National Laboratories				
Restoration	15,600	16,700	17,800	9,500
Revitalization	0	6,900	13,200	13,700
Prevention of Deterioration				
General Plant Projects	5,000	6,400	6,600	7,100
Basic Capital Equipment	27,708	29,850	25,200	28,820
Operating Expenses b/	47,518	50,131	53,089	55,743
Subtotal	95,826	109,981	115,889	114,863
Nevada Operations Office				
Restoration	19,400	19,200	14,300	7,600
Revitalization	17,500	26,600	17,900	40,000
Prevention of Deterioration				
General Plant Projects	7,100	7,500	7,700	7,700
Basic Capital Equipment	36,180	35,240	38,875	56,400
Operating Expenses b/	23,875	26,120	29,269	30,732
Subtotal	104,055	114,660	108,044	142,432
Total Research, Development, and Testing	$387,627	$452,788	$445,078	$484,443

---

a/ Unless otherwise noted, the sources for data are the FY 1985, FY 1986, and FY 1987 Congressional Budget Books.

b/ The sources of these data after FY 1983 is the MA-22 analysis of Maintenance as gathered from the FIS. The data shown in these columns is for the entire Weapons Program. It is not broken down to the OMA level.

Weapons Activities
Summary of Restoration, Revitalization, and Prevention of Plant Deterioration
($ in Thousands) a/

	FY 1984 Actual	FY 1985 Actual	FY 1986 Estimate	FY 1987 Estimate
Production and Surveillance				
Albuquerque Operations Office				
Restoration	$ 47,500	$ 55,100	$ 25,500	$ 3,800
Prevention of Deterioration				
General Plant Projects	16,065	18,300	21,100	24,600
Basic Capital Equipment	59,525	65,695	80,800	90,750
Operating Expenses b/	96,526	108,602	117,628	123,509
Subtotal	219,616	247,697	245,028	242,659
Oak Ridge Operations Office				
Restoration	68,500	37,800	59,800	75,300
Prevention of Deterioration				
General Plant Projects	6,935	8,800	7,600	7,400
Basic Capital Equipment	24,650	24,000	23,130	20,550
Operating Expenses b/	65,003	72,445	76,846	80,688
Subtotal	165,088	143,045	167,376	183,938
Savannah River Operations Office				
Restoration	3,400	3,000	0	0
Prevention of Deterioration				
General Plant Projects	0	0	0	0
Basic Capital Equipment	7,000	3,600	2,120	2,800
Operating Expenses b/	155,896	166,916	179,292	188,257
Subtotal	166,296	173,516	181,412	191,057
Total, Production and Surveillance	$ 551,000	$ 564,258	$ 593,816	$ 617,654

Weapons Activities
Summary of Restoration, Revitalization, and Prevention of Plant Deterioration
(Continued)
($ in Thousands) a/

	FY 1984 Actual	FY 1985 Actual	FY 1986 Estimate	FY 1987 Estimate
Weapons Activities Summary				
Restoration	$ 185,000	$ 165,000	$ 152,300	$ 116,900
RD&T Revitalization	29,140	57,300	47,900	72,900
Prevention of Deterioration				
General Plant Projects	45,100	53,600	56,200	61,000
Basic Capital Equipment	191,020	200,915	201,419	241,170
Operating Expenses b/	488,367	540,231	581,075	610,127
Total, Weapons Activities	$ 938,627	$1,017,046	$1,038,894	$1,102,097

---

a/ Unless otherwise noted, the source for data are the FY 1985, FY 1986, and FY 1987 Congressional Budget Books.

b/ The source of these data after FY 1983 is the MA-22 analysis of Maintenance as gathered from the FIS. The data shown in these columns is for the entire Weapons Program. It is not broken down to the OMA level.

Question: Please provide a table showing the funding for environmental activities for FY 1984 - FY 1987. Please provide this information by location at each site with a brief description of each environmental problem.

Answer: We do not budget for or collect costs for environmental compliance; however, we can provide estimates that show approximate costs for environmental compliance and protection for FY 1984-FY 1987. The following estimates include operating costs, capital equipment costs, and construction line items including general plant projects.

	(Estimated B/A in Millions)			
Site	FY 1984	FY 1985	FY 1986	FY 1987
Albuquerque Operations Office	$ 30.8	$ 36.4	$ 46.8	$ 73.7
Oak Ridge Operations Office	30.0	63.6	72.1	68.0
Nevada Operations Office	37.7	44.4	54.8	55.1
San Francisco Operations Office	8.7	10.3	15.2	17.9
Total	$107.2	$154.7	$188.9	$214.7

The major portion of the funding for environmental compliance activities is for routine operating expenses for staff and associated expenses for environmental assessments, site characterization, monitoring, treatment of effluents, and waste management. Following are active line item construction projects to address specific environmental concerns.

Oak Ridge - 84-D-124, Environmental Improvements, includes construction of new facilities and modification of some existing facilities for the handling and treatment of liquid and solid wastes and for the containment or elimination of major pollution sources and hazards.

Oak Ridge - 85-D-121, Air and Water Pollution Control Facilities, will provide facilities for reducing mercury in liquid effluents and for controlling particulate uranium emissions from process stacks.

The two Oak Ridge projects respond to a Memorandum of Understanding between Department of Energy, Environmental Protection Agency, and the Tennessee Department of Health and Environment. The Memorandum of Understanding details the objectives and major actions toward full compliance in areas of existing noncompliance. Failure to meet the objectives could result in legal actions by the State and/or EPA aimed at shutting down certain operations critical to the manufacture of nuclear weapons components at Y-12. Since these operations are not duplicated in the weapons complex, a shutdown would seriously effect the national defense effort.

Albuquerque - 86-D-122, Structural Upgrade of Existing Plutonium Facilities will upgrade the Class 1 plutonium facilities at Rocky Flats which do not meet current wind loading criteria and thereby reduce the risk of catastrophic failure due to natural wind forces.

Albuquerque - 87-D-127, Environmental, Safety, and Health Upgrade will correct numerous deficiencies to the site storm and sanitary water systems at the Mound Plant near Dayton, Ohio. Without this project, Mound will continue to be in violation of its NPDES permit and will not comply with a Consent Order issued by the State of Ohio.

San Francisco - 85-D-102, Tritium Facility Upgrade, will provide safety and monitoring control of tritium facilities at the Lawrence Livermore National Laboratory to reduce tritium releases to the environment.

San Francisco - 86-D-103, Decontamination and Waste Treatment Facility will replace existing 40-year-old facilities at the Lawrence Livermore National Laboratory with a centralized facility which brings it into full compliance with the Resource Conservation and Recovery Act.

San Francisco - 87-D-102, Environmental Compliance and Cleanup will clean up various areas of groundwater and soil contamination at Lawrence Livermore National Laboratory and Site 300. The Environmental Protection Agency has named Lawrence Livermore National Laboratory as a candidate for the National Priority List (under Superfund) because of off-site contamination and groundwater with organic solvents. The proposed project is to correct these problems and bring the facility into compliance. The various parts of the project encompass work on cleaning up organic solvents in the groundwater, clean up of a gasoline spill caused by a leaking underground tank, review and correction of other underground tanks, assess and conduct remedial action on landfills, take correction action on PCB problems, constructing an incinerator, etc.

Various Locations - 86-D-123, Environmental Hazards Elimination. This project eliminates waste water contamination at the Bendix Plant, Kansas City, Missouri, and eliminate of PCB from electrical systems at Bendix, Pinellas, Rocky Flats, and Y-12 Plants, and the Los Alamos National Laboratory.

Question. Describe the status of the W79 and the W82 AFAP activities.

Answer: The W79 completes production in August 1986. The W82 begins production engineering in May 1986 and is scheduled to enter production DELETED The planned mix is DELETED within the authorized quantity of 925 modern artillery warheads.

Question: Please describe the status of the Sentry/Load system warhead.

Answer: There are no development or preproduction activities associated with the now terminated Sentry/Load program.

Question: How much is included in the FY 86 and FY 87 request for the "Midgetman" warhead concept? Describe the status of DOD and DOE's development.

Answer: DOE and DOD are in the final portion of the warhead technical feasibility (Phase 2) study. DOE anticipates embarking on the weapon design and cost phase (Phase 2A) during the early summer of 1986.

Most FY 1986 and FY 1987 funding allocated to the system is for research, development, and testing activities. However, costs are not identified to a specific system before Phase 3 because before that time, research, development, and testing activities are mutually beneficial to more than one system. For production and surveillance, no funds are planned to be allocated for the Small Intercontinental Ballistic Missile in FY 1986; less than $1 million is estimated to be allocated in FY 1987 for early production/process engineering work.

Question: What is the total estimated cost (OE and PACE) and BA allocated for each year of research, development, and production for the SRAM II warhead? Please provide the total quantities or builds and the estimated per unit costs of the warhead.

Answer: The Short Range Attack Missile II is currently in Phase 2. No definitive cost estimate will exist for the system until the end of Phase 2a when the Weapon Design and Cost Report is published by the Department of Energy. As such, research, development, and testing costs are not identified by system until after that time. The Production and Surveillance request for FY 1987 contains an estimated allocation DELETED for SRAM II in FY 1987, which would support early production/process engineering work. No construction estimates are available in the FY 1987 budget.

Delivery Schedule for SRAM II (from NWSM)

Units DELETED

Question: Describe the need for the new tactical bomb. Provide for the record the total estimated cost (both OE & PACE) and the BA allocated for each year through the end of production. What is the number of total builds and the annual schedule for this new warhead?

Answer: When the budget was originally submitted, there were four mods of the B61 planned, the B61-6/8 and the B61-3D/4D. Since that time, the B61-6/8 program has been canceled in favor of building additional B61-3/4's, DELETED The additional B61-3/4's will be identified as an ALT. The 3/4 mods of the B61 feature improved safety and command and control (Category F Permissive Action Link). The purpose of these weapons is to replace older, less-secure bombs that are currently deployed overseas. The B61-3D/4D program will replace Navy B43's, B57's, and older mods of the B61. The B61-3D/4D design will meet modern safety criteria and will have a Category D Permissive Action Link. The total requirement for tactical nuclear gravity bombs is currently under review by the joint Department of Defense/Department of Energy Tactical Bomb Stockpile Initiative working group. The Tactical Bomb Stockpile Initiative recommendations may result in future modifications to the quantities and types of weapons in the tactical bomb stockpile.

B61 Stockpile:

B61-3
B61-4
B61-3D DELETED
B61-4D

Builds

Neither total estimated costs nor capital estimates are available for these systems in the FY 1987 budget. However, the FY 1987 Production and Surveillance budget does show allocations of $2.5 million for these systems based upon the former schedule. This funding will likely be reallocated to other systems in view of the schedule change.

Question: Provide a table listing all weapons in or about to enter Phase 3 and Phase 4 and estimated funding levels for each weapon in FY 85, FY 86, FY 87 and anticipated for FY 88 and FY 89.

Answer: There are five systems currently in Phases 3 and 4. Estimated allocations of direct Production and Surveillance operating and construction costs are contained in the following table:

Production and Surveillance
Estimated Funding Allocations
Systems in Phase 3 and 4
(B/A $ in Millions)

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Estimate	FY 1988 Estimate	FY 1989 Estimate
W81			DELETED		
W82					
W87					
W88					
ASW/SOW					

Question: Provide a table listing all weapons systems in Phase 2 in FY 85, FY 86, FY 87, and FY 88 with estimated funding for each system.

Answer:

1. The following systems were in Phase 2 and 2A in FY 1985 and continue in Phase 2 in FY 1986:

   Small Intercontinental Ballistic Missile
   Short Range Attack Missile

2. The following systems are in Phase 2 and 2A or may enter Phase 2 and 2A in FY 1986:

   Lance Follow-on Missile
   DELETED
   Antisubmarine Nuclear Depth/Strike Bomb

3. In addition to the above, the following may enter Phase 2 in FY 1987:

   Strategic Relocatable Target Weapon

4. Additional weapons concepts which may enter Phase 2 in FY 1987 or FY 1988 are not now known.

Demolition Munitions

Question: Please provide a table showing the number of W45, MADM and B54, SADM munitions stockpiled, their location, their useful life, and the schedule and status of retirement.

Answer: All W45 (MADM) munitions have been retired, and there are none in the inventory. All European deployed B54 (SADM) warheads were removed by end-FY 1985 (as announced publicly at the October 1985 meeting of NATO's Nuclear Planning Group)

DELETED

Question: How much special nuclear material is included in each of these weapon systems (W45, B54)?

Answer: The W45 (no longer stockpiled as an ADM warhead is still used in Terrier missile system) and the B54 special nuclear material quantities are as follows:

DELETED

Standard Missile-2

Question: What is the new schedule for deployment of the W81, SM-2 warhead including the total number required?

Answer: At the time the FY 1987 budget was submitted, expected IOC for the SM-2(N) was DELETED However, due to a budget restructure caused by FY 1986 Congressional appropriations reductions for SM-2(N) development, IOC for this weapon has been delayed DELETED Initial planning estimates indicate that DELETED SM-2(N)s will be required to meet projected shipfill, reload, and maintenance pipeline requirements.

Question: Provide a breakdown of all funding requested in FY 85, FY 86, and FY 87 for this warhead.

Answer: Direct production and surveillance funding requested for this warhead in FY 1985, FY 1986, and FY 1987 is as follows:

	(B/A $ in Millions) FY 1985 Actual	 FY 1986 Estimate	 FY 1987 Estimate
Total		DELETED	

Question: Explain the military need for the new nuclear warhead and the full capability of the warhead design.

Answer: The SM-2(N) is an important element of Navy AAW doctrine and is needed to counter nuclear anti-ship cruise missiles (ASCMs) such as the Soviet AS-4. A defensive weapon, it is specifically designed for kill of the incoming ASCMs nuclear warhead. Analysis has shown that nuclear-armed ASCMs

DELETED

Antisubmarine

Question: Describe the status of the DOD and DOE's development of the antisubmarine warfare/standoff weapon.

Answer: The Phase 2A Design Definition and Cost Study has recently been completed for Antisubmarine Warfare/Standoff Weapon, now known as Sea Lance. The Navy has completed the Defense Systems Acquisition Review Council II and will proceed with full scale engineering development for the weapon system. The Navy is also processing a request that Department of Energy proceed into Phase 3 engineering development for the nuclear payload. It is expected that Phase 3 will commence in August 1986.

Question: Provide for the record a breakout of the total estimated cost (including operating and PACE), total builds, per unit cost of the warhead, and the amount spent and remaining cost.

Answer: The life cycle cost estimate for the Antisubmarine Warfare/Standoff Weapon as published in the Weapon Design and Cost Report follows:

	($ in Millions)
Research, Development, and Testing	$ 398.1
Production and Surveillance	DELETED
Construction	119.9
Total	$DELETED

Of this total, actual costs incurred for this system through the second quarter of FY 1986 total about $100,000. DELETED

Question: Have there been any delays in the DOD discussions on this system?

Answer: The antisubmarine warfare/stand-off weapon development and production schedule has been unchanged for the last year.

Question: What is the status of the authorization and appropriations--both DOD and DOE--for this system? Provide a breakdown of DOD and DOE funding for FY 85, FY 86, and FY 87.

Answer:

Estimated Funding Allocations
Direct Operating Costs and Construction
(B/A $ in Millions)

	FY 1985 Actual	FY 1986 Estimate	FY 1987 Estimate
Research, Development, and Testing Operating Expenses	$ 25.2	$ 50.6	$ 61.4
Production and Surveillance Operating Expenses		DELETED	
Construction	-	5.0	47.0
Total	$	DELETED	

Estimated Funding Allocations
for the Department of Defense
($ in Millions)

	FY 1985	FY 1986	FY 1987
Research, Development, Testing, and Equipment	$ 51.1	$ 74.8	$118.4

Question: Describe the status of the DOD and DOE development Antisubmarine Warfare Nuclear Depth/Strike Bomb.

Answer. A joint Phase 2A Design Definition and Cost Study commenced in February 1986. The study should be completed in time to support the start of Phase 3 Development Engineering in about a year.

Question: Have there been any delays in the DOD discussions on this system?

Answer: Since the decision to pursue a Phase 2A was made in November 1985, there have been no delays in proceeding with the study.

Question: What is the status of the authorization and appropriations--both DOD and DOE--for this system?

Answer: The research, development, and testing funding allocated to this Pre-Phase 3 system remains part of the level of effort and is not specified until Phase 3. The Department of Energy is planning an initial estimated allocation of about DELETED in production and surveillance direct operating expenses for production/process engineering in FY 1987. Construction funding is anticipated to be requested in FY 1988. The Antisubmarine Nuclear Depth/Strike Bomb is a new start in FY 1987.

Strategic Defense Initiative

Question: The Administration has submitted an FY 1986 supplemental request for $62 million for the DOE Strategic Defense program. The funds for this supplemental request are to come from DOD appropriations. Please explain why this transfer is used rather than a request for new appropriations.

Answer: An appropriation transfer will not increase Federal outlays and is deficit neutral as compared to a supplemental request.

Question: Does this request imply that the FY 1986 DOD appropriation was excessive?

Answer: No. In FY 1986 the Strategic Defense Initiative budget was reduced $1,000,000,000 which required Strategic Defense Initiative Organization program restructuring. As part of this restructuring, high priority experiments such as nuclear directed energy weapons were accelerated for early resolution of critical nonnuclear systems and survivability issues. If funds were not transferred they would be used to restore some of the efforts deleted in program restructuring and to provide funds for some efforts that could readily be accelerated.

Question: What, specifically, will these funds be used for in FY 1986?

Answer: The appropriation transfer will be used to accelerate research on nuclear driven directed energy weapons research. This research is necessary to understand the Soviet capability against any defensive systems we may develop; understand the Soviet capability there might be against our present deterrent forces; and to investigate a nuclear strategic defense option if needed.

Question: What programs and what laboratories are expected to be funded?

Answer: All of the weapons laboratories will receive funding from the appropriation transfer. Funding will be allocated to support all four major nuclear directed energy weapons concepts including the x-ray laser, hypervelocity pellets, electromagnetic concepts, and optical lasers as well as vulnerability and lethality studies. DELETED

Question: What is the effect on laboratory manpower of this supplemental request?

Answer: Laboratory strategic defense initiative staffing will increase on the order of about 140 FTE's total for Sandia National Laboratories, Lawrence Livermore National Laboratory, and Los Alamos National Laboratory.

Question: Provide a table showing the manpower requirements for the Strategic Defense Initiative for FY 1985, FY 1986, and FY 1987. Please provide this by laboratory.

Answer: The estimated manpower requirements for Department of Energy nuclear directed energy weapons are provided in a table which I would like to insert in the record.

(The information follows:)

	FY 1985	FY 1986	FY 1986 Appropriation Transfer	FY 1987
Nuclear Directed Energy Weapons				
Los Alamos National Laboratory	210	195	65	610
Lawrence Livermore National Laboratory	400	425	41	725
Sandia National Laboratories	220	320	34	515
Total	830	940	140	1,850

Question: Provide the funding for the Strategic Defense Initiative by location for FY 1985, FY 1986, and FY 1987.

Answer: The estimates for Department of Energy nuclear directed energy weapons are provided in the following table:

(The information follows:)

Strategic Defense Initiative
(Dollars in Millions)

	FY 1985	FY 1986	FY 1986 Appropriation Transfer	FY 1987
Nuclear Directed Energy Weapons				
Lawrence Livermore National Laboratory	$ 66.1	$ 69.2	$ 40.0*	$139.8
Los Alamos National Laboratory	33.3	44.7	14.0*	122.8
Sandia National Laboratories	29.5	41.8	8.0	98.9
Nevada Operations Office	86.1	114.2	0	174.5
Total	$215.0	$269.9	$ 62.0	$536.0

---

*About $17 million from Lawrence Livermore National Laboratory and $3 million from Los Alamos National Laboratory will be provided to the Nevada Test Site in support of the laboratory programs.

Question: Provide the FY 1985, FY 1986, and FY 1987 funding for x-ray laser, hypervelocity pellets, high power electromagnetically-generated weapons, and optical frequency lasers. Provide this by location.

Answer: The operating estimates are provided in a table which I would like to insert in the record. Capital and construction are not broken out by individual effort.

(The information follows:)

Nuclear Directed Energy Weapons
Operating Expenses
(Dollars in Thousands)

FY 1985	FY 1986	FY 1986 Appropriation Transfer	FY 1987

DELETED

Question: Which of the concepts under development appear to offer the most promise for the future?

Answer: With respect to the nuclear directed energy weapon concepts being investigated by the Department of Energy, our focus at this time is to understand the Soviet capability against our present deterrent forces and any defensive system we may develop. It is premature to assess which concept or concepts may hold the greatest promise. As a component, if necessary, of a U.S. strategic defense initiative system all concepts are at a relatively early stage of feasibility research. While one or two might be considered more mature at this point in time, the level of maturity is not a reliable indicator of future success. It would not be prudent to narrow the scope of research before sufficient data is in hand to assess technical feasibility of each concept being considered.

Question: What is the funding from within the testing program that is directed at the SDI program?

Answer: In FY 1987, we estimate that about DELETED in test operating expenses will be related to strategic defense research. The overall weapons test operating budget request is $633.8 million. The FY 1986 estimate is about DELETED within an overall test budget of about $501.4 million. The appropriation transfer would provide for about $13.0 million in test operating funds.

Inertial Confinement Fusion

Question: The ICF program has been reduced in FY 1987, and in large part included in the Research and Development budget. Please describe the status of this program and the reasons for the cuts.

Answer: Inertial fusion research and development activities are a part of the technology base of the overall weapons program. The Department of Energy has proposed that these activities at the national weapons laboratories be funded in fiscal year 1987 as part of the Weapons Research, Development, and Testing, so that priorities can be set at each laboratory to meet our nuclear weapons and Strategic Defense Initiative commitments to the Department of Defense, as well as protect the technology base against erosion during a time of severe budgetary limitations. Based on consultations with the laboratory directors, we expect inertial fusion activities within the weapons technology base to be maintained at near the fiscal year 1986 levels, commensurate with the higher priorities for nuclear weapon and Strategic Defense Initiative commitments. The programs at the inertial fusion support laboratories are supported at slightly below the fiscal year 1986 level in the President's budget request.

Question: Please provide a table showing the FY 84, 85, 86, and 87 funding by each location for operating expenses and PACE.

Answer: A table providing inertial fusion funding by site is submitted for the record.

(The information follows.)

Inertial Fusion Funding
($ in Millions)

	FY 1984	FY 1985	FY 1986	FY 1987
Operating				
Lawrence Livermore National Laboratory	$ 59.0	$ 68.2	$ 62.8	$ 36.0
Los Alamos National Laboratory	43.6	41.5	29.5	21.5
Sandia National Laboratories	20.3	20.8	21.9	29.0
KMS Fusion	10.8	13.0	13.1	12.0
University of Rochester	5.9	7.8	7.0	8.0
Naval Research Laboratory	3.6	2.7	2.5	2.5
Other	1.8	0.8	1.2	-
Total, Operating	145.0	154.8	138.0	109.0
Capital Equipment				
Lawrence Livermore National Laboratory	4.7	5.0	4.0	3.0
Los Alamos National Laboratory	2.9	2.4	2.6	2.0
Sandia National Laboratories	1.4	2.0	1.5	2.7
KMS Fusion	0.7	0.7	0.5	0.5
University of Rochester	1.7	0.3	0.5	0.5
Naval Research Laboratory	0.3	0.3	0.3	0.3
Other	-	0.3	-	-
Total, Capital Equipment	11.7	11.0	9.4	9.0
Construction				
Lawrence Livermore National Laboratory	-	-	-	-
Los Alamos National Laboratory	-	-	-	-
Sandia National Laboratories	12.9	3.5	-	-
KMS Fusion	-	-	-	-
University of Rochester	-	-	-	-
Naval Research Laboratory	-	-	-	-
Total, Construction	12.9	3.5	-	-
Total, Inertial Fusion	$169.6	$169.3	$147.4	$118.0

Supplemental Request

Question: Can you provide us with a list of the major items of capital equipment at each location and the full cost of the equipment?

Answer: Of the $62 million requested appropriation transfer, $32.3 million will be used to purchase capital equipment as shown in the following table:

(B/A $ in Millions)

	LLNL	LANL	Sandia	Total
Research and Development	$ 9.0	$ 3.3	$ 4.0	$16.3
Testing	16.0	-	-	16.0
Total	$25.0	$ 3.3	$ 4.0	$32.3

Capital equipment includes test-related hardware such as diagnostic trailers and measuring-instrument calibration devices as well as equipment to support laboratory experiments and materials research, fabrication, and characterization. Most of the capital equipment is sufficiently generic that it could also be used to support other laboratory programs. Virtually all the weapons research programs underway at the national laboratories have need for test-related and materials development equipment.

Question: Please provide us with a breakdown of the additional personnel needs at each location and the estimated cost for each.

Answer: The fully loaded estimated costs for additional research and development laboratory personnel at each location is provided in the following table:

(B/A $ in Millions)

	B/A	FTE
Lawrence Livermore National Laboratory	$ 5.0	41
Los Alamos National Laboratory	7.7	65
Sandia National Laboratories	4.0	34
Total	$16.7	140

Question: Please provide us with an estimate on how these funds would affect the number of tests, the complexity of these tests and the timing of the individual tests.

Answer: Prospects for improved technical content and timely execution of the DELETED planned advanced development category strategic defense initiative related tests in FY 1987 should improve. We do not believe it is feasible at this late date to attempt to add another test to our schedule for this fiscal year or alter the current complexity of test experiments.

Question: For the record, please provide a breakdown of the full operating expense request which includes the amount for FTE's at each location, and the amount for contract studies/contract activities with a description of each major activity.

Answer: The operating expense breakdown, and the associated laboratory research and development FTEs, are shown in the following table:

(B/A $ in Millions)

	LLNL	LANL	Sandia	Total
Research and Development	$ 5.0	$ 7.7	$ 4.0	$16.7
Testing	10.0	3.0	-	13.0
Total	$15.0	$10.7	$ 4.0	$29.7
FTE	41	65	34	140

These funds will be used to accelerate the highest priority nuclear directed energy weapons research toward a technology-limited pace. Funds will be used to accelerate critical underground nuclear tests and to add additional people to the research efforts and support outside contracts. As a result of the overall increased level of effort, support activities will be augmented in the areas of design physics, computational modeling, diagnostics development, laboratory experiments, advanced materials development, and advanced engineering. A relatively minor amount of approximately 10 percent would be provided to outside contractors for activities such as materials development and procurements.

Production Reactors at Savannah River

Question: What is the status of the production reactors at Savannah River?

Answer: Five reactors -- R, P, L, K, and C, were constructed at the Savannah River Plant and placed in operation beginning in December 1953. R Reactor was shut down in June 1964 and placed in an inactive status. L Reactor was shut down in February 1968 at a time when there was insufficient demand for nuclear materials to justify operation of four reactors. Following extensive renovations, it was restarted in October 1985, when the projected demand for nuclear materials showed an additional reactor would be needed. P, K, and C Reactors have operated continuously since startup in the mid-1950's. At this time, C Reactor is undergoing extensive repairs, but it should be operational in a few months.

Environmental Problems of Production Reactors

Question: Please describe the environmental problems associated with the operation of the production reactors.

Answer: The major environmental problem due to the Savannah River Plant, SRP, reactor operation is the direct discharge of reactor cooling water to onsite creeks. Under the Federal and State of South Carolina implementing regulations for the Federal Water Pollution Control Act of 1972, as amended, the reactor cooling water, which is 160°F, would have to be cooled to 90°F prior to discharge to surface waters. The Department of Energy, DOE, entered into a Consent Order with the South Carolina Department of Health and Environmental Control, SCDHEC, to comply with conditions specified in the National Pollutant Discharge Elimination System permit for SRP. Engineering studies identified several options to cool the reactor thermal discharges. Based on topographic and cost considerations, DOE has recommended, and SCDHEC has indicated concurrence with, the construction of once-through cooling towers for C and K Reactors. On March 28, 1986, DOE issued a draft environmental impact statement on alternative cooling water systems at the Savannah River Plant for public comment.

Another potential environmental problem associated with production reactor operation is the use of seepage basins to dispose of slightly radioactively contaminated process waste water. Although direct release of this water to the site streams would be acceptable, the seepage basins are used to delay the transport of radionuclides to surface water, thus allowing radioactive decay and a reduction in the quantity of radionuclides reaching the surface water. DOE is analyzing the continued usage of the seepage basins together with other treatment alternatives for the production reactors and is obtaining public inputs on this proposal through the public involvement process for the environmental impact statement on waste management activities for groundwater protection at the Savannah River Plant, draft document expected by the end of 1986.

Construction of Cooling Lake at Savannah River

Question: What is the status of the construction of the cooling lake at Savannah River?

Answer: Construction of L Pond was completed in October 1985, and it was immediately placed in operation with the restart of L Reactor. Temperature probes to monitor the ability of the pond to cool the reactor effluent are in operation with further refinements planned.

Cooling Towers at Savannah River

Question: Describe the need and cost of additional cooling towers at the Savannah River site.

Answer: Since the early 1950's, the C, K, and L production reactors at the Savannah River Plant, SRP, have used onsite streams and the Savannah River swamp for cooling of reactor thermal effluents. Provisions of early National Pollutant Discharge Elimination System, NPDES, permits for SRP under the Federal Water Pollution Control Act designated the point of thermal compliance at the Savannah River, thus allowing this type of operation. It should be noted that P Reactor utilizes an existing onsite cooling lake which we believe the State of South Carolina will find acceptable, based on studies we recently completed. In November 1982, during negotiations on a new NPDES permit, the South Carolina Department of Health and Environmental Control determined that, to conform to existing laws and regulations, the point of technical compliance would be changed to the point where the reactors discharge into the onsite streams which are near the reactor buildings. Consequently, a cooling lake was constructed for L Reactor prior to restart of the reactor. In a Consent Order associated with the new NPDES permit, the Department of Energy committed to evaluate and recommend to the State, methods of thermal mitigation for the C and K Reactors, and, subsequently support implementation of the selected alternative. Changes in Environmental Protection Agency regulations on stream reclassification in late 1983 prevented DOE from considering potential partial mitigation options for these reactors, thus once-through cooling towers were the lowest cost option evaluated and were recommended to the State by the Savannah River Operations Office. If funding is approved by Congress, $109 million is required to complete construction of the cooling towers and $7 million annually to operate them.

Thermal Discharge Off Savannah River Site

Question: What is the thermal discharge off the Savannah River site, with and without the cooling lake?

Answer: Based on 30-year average values for meteorological conditions, the temperature of the L Reactor effluent at the site boundary, which is the Savannah River, would range from 29 degrees Celsius, C, in the summer to 13 degrees C in the winter with L Pond. Without L Pond, the temperature at the same location would range from 33 degrees C in the summer to 21 degrees C in the winter. It is a requirement of the National Pollutant Discharge Elimination System permit that the temperature not exceed 32.2 degrees C and that the change in temperature due to operations not exceed 2.8 degrees C.

Question: What is the thermal discharge off the Savannah River site, with and without the additional cooling towers?

Answer: The thermal discharges from the C- and K-Reactors flow into the Savannah River mainly through Four Mile Creek and Steel Creek. With the installation of once through cooling towers, the temperature at the mouth of the creeks during reactor operation should be approximately the same as the ambient temperature. The calculated average creek mouth temperature is as follows:

	Ambient Temperature		Thermal Discharge	
	Winter	Summer	Winter	Summer
Four Mile Creek	11.1°C	24.5°C	15.3°C	38.9°C
Steel Creek	8.8°C	26.0°C	10.8°C	31.2°C

Environmental Damage at the Savannah River Site

Question: What damage to the environment is being done on and off the Savannah River site as a result of the operation of the production site?

Answer: The most observed environmental impact of Savannah River Plant operations is the denuded creek beds, which are Four Mile Creek and Pen Branch, and associated deltas in the Savannah River swamp from cooling water discharged from the production reactors. There is virtually no biological life in the hot portion of these creeks and the affected Savannah River swamp system. However, these hot water discharges have no detectable environmental effects on the overall health of the Savannah River. The Department of Energy is proposing the construction of once-through cooling towers to bring the production reactor thermal discharges into compliance with applicable Federal and State of South Carolina requirements.

The other major environmental effect of SRP operations is the contamination of groundwater due to past operating and disposal practice. DOE is aggressively pursuing construction and operation of treatment systems to reduce discharges of pollutants to the environment, operation of a groundwater cleanup system, and assessments of the extent of groundwater contamination so as to control and minimize potential environmental effects. DOE is preparing an environmental impact statement which will provide an opportunity for public inputs on the proposed modifications to the SRP waste management activities to protect groundwater.

There are other environmental effects resulting from SRP operations; for example, releases of radionuclides to the atmosphere and surface water. However, these environmental effects are minor and well within all applicable requirements.

Cleanup Work at Fernald

Question: Please describe the clean up work that is being conducted at the Fernald site.

Answer: Currently, and in the near future, the cleanup efforts at the Feed Materials Production Center will concentrate primarily on characterization of waste pits, silo residue, waste streams, groundwater contamination, soil contamination, and buried and aboveground rubble. As completion of characterization activities permit, plans will be developed and implemented to stabilize, as required, and subsequently dispose of waste materials in accordance with applicable laws and regulations. Ongoing cleanup efforts include shipment of low-level wastes to the Nevada Test Site for disposal and improvements in the general housekeeping practices of facility operations.

Fernald Environmental Funding

Question: What funding is being directed at the cleanup of the Fernald site in FY 1985, FY 1986, and FY 1987?

Answer: Funding for environmental protection and compliance at Fernald for the years requested follows. Please note that we have a new contractor on board at Fernald who is now reviewing the FY 1986 and FY 1987 funding allocation. The funding allocated to environmental matters is likely to increase as a result of this review.

Fernald Environmental Funding
(B/A in Millions)

	FY 1985	FY 1986	FY 1987
Nuclear Materials Production			
Operating Expenses	$ 6.0	$ 7.0	$ 9.0
Capital Equipment	4.6	3.9	
Construction			
General Plant Projects	0.1	0.9	
83-D-146, Water Pollution Control	4.1		
87-D-159, Environmental, Safety, and Health Improvements, Phase I			10.0
Subtotal	$ 14.8	$ 11.8	$ 19.0
Defense Waste and Transportation Management			
Operating Expenses	$ 3.3	$ 3.1	$ 5.7
Capital Equipment	0.3	0.2	0.3
Construction			
General Plant Projects	0.5	1.1	1.5
86-D-174, Low-Level Waste Processing and Storage System	0.0	2.4	10.0
Subtotal	$ 4.1	$ 6.8	$ 17.5
Total	$ 18.9	$ 18.6	$ 36.5

Question: Describe the budget authorization and appropriation for Fernald clean up in FY 1986.

Answer: Within the Nuclear Materials Production program, $11.8 million is included for continuing efforts. The budget authorization and appropriation for Fernald clean up in FY 1986 is $11.8 million, and includes continued funding to comply with applicable environmental requirements, including groundwater, soil sampling, health physics, and outside analytical services. Included in the above amount is $3.9 million in capital equipment for items such as dust collectors, high efficiency particulate air filters, surface decontamination equipment, and an atmospheric dispersion model.

The Defense Waste and Byproducts Management efforts are directed at management of the low-level waste stored at the site. Some of the waste which can be disposed of with minimal processing is being shipped to the Nevada Test Site for disposal. Project 86-D-174 has been initiated in FY 1986 to provide a permanent facility to allow all newly generated low-level waste to be shipped offsite for disposal beginning in FY 1988. Activities also underway in FY 1986 include characterization of the waste stored in pits and silos at the site and development of options for final disposal of this waste.

Research Programs to Improve Production

Question: Describe the status of research programs designed to improve the production at existing reactors.

Answer: Research programs at both the Savannah River Plant and the Hanford site are being conducted to assure continued production. At the SRP, studies of potential long-term life-limiting mechanisms and their mitigating actions are currently underway, with a final report expected in June, FY 1989. The ongoing restoration and productivity retention programs will assure the continued reliability of the SRP reactors. A recently completed study of the N Reactor concludes that this facility can be reliably operated through the mid-1990's and that several cost-effective alternatives are available to refurbish N Reactor and extend its useful life well into the next century. Further study and research on these alternatives will take place over the next several years, and decisions will not be required until the late 1980's and can be phased so that the refurbishment program is tailored to material needs and budgetary constraints. Development of a higher productivity plutonium charge, the Mark 22S-25, has been underway at SRP for several years, with operation of a demonstration charge currently scheduled for FY 1989. Since utilization of this charge will significantly impact uranium feed material requirements, the implementation decision will be based on an analysis of material supply and budget requirements.

Extend Life of N Reactor

Question: Please describe the program to extend the life of "N" reactor at Richland.

Answer: N Reactor can be operated safely and economically until the mid-1990's with surveillance, maintenance, and selective replacement of fuel pressure tubes. However, years of neutron bombardment is resulting in the distortion of the graphite stack and embrittlement of the pressure tubes. In addition, normal aging processes are causing gradual deterioration of equipment in the balance-of-plant systems leading to increased reliability and efficiency problems. In order to extend the life of N Reactor beyond the year 2000, we are expanding our graphite stack and pressure tube surveillance program to better characterize the nature and timing of the aging phenomena and to support decisions on the type of renovation work that will be required to extend the reactor life. Presently, we see the need to either refurbish or replace the graphite stack and many of the process tubes in the mid-1990's requiring a construction line item in the early 1990's. The balance-of-plant systems will be addressed as part of a continuing comprehensive maintenance program.

Number of Reactors on Tritium

Question: Once the stockpile requirements for plutonium are met, how many reactor years of tritium are required on a continuing basis?

Answer: Production of tritium in the Savannah River reactors is always scheduled before plutonium production.

DELETED

Status of New Replacement Reactor

Question: What is the status of work on a New Replacement Reactor? How much is included in the budget in FY 1985, FY 1986, and FY 1987 for a New Replacement Reactor? What is the expected TEC of such a reactor?

Answer: The decision to deploy a New Production Reactor, NPR, has been deferred for several years until completion of life extension studies for the existing Savannah River Plant production reactors and refurbishment plans for the N Reactor are finalized and requirements for materials production confirm the need for an NPR.

In FY 1985, $3.0 million was expended for the New Production Reactor, NPR, for preconceptual design activities. In FY 1986, $6.1 million was budgeted for NPR activities. However, the NPR program is being deferred, and all efforts and studies are being brought to a logical termination in FY 1986. There are no funds included in the FY 1987 budget for the NPR program.

The expected total estimated cost of a large New Production Reactor could range from $2.8 billion for a Heavy Water Reactor to $4.4 billion for a High-Temperature Gas Reactor in 1985 constant year dollars. These estimates assume the Idaho National Engineering Laboratory as the reference site. Other sites were also considered--the Savannah River Plant and the Hanford site.

Employment Levels

Question: Please provide the employment levels at all Materials Production sites in FY 1985, FY 1986, and FY 1987.

Answer: Contractor employment levels at Materials Production sites follows:

Employment Levels*
Nuclear Materials Production
(Full-Time Equivalents)

	FY 1985	FY 1986	FY 1987
Albuquerque	338	323	205
Idaho	945	982	982
Oak Ridge	1,486	1,695	2,009
Richland	3,501	3,807	4,084
San Francisco	372	423	441
Savannah River	6,784	6,830	6,895
Total	13,426	14,060	14,616

*This data represents prime contractor operation personnel. Construction subcontractor employment, which fluctuates with the level of construction effort, is not included.

Special Isotope Separation

Question: What is the status of the readiness review of the competing Special Isotope Separation process required in the conference report on the FY 1986 Energy and Water Development Appropriation Act?

Answer: The process readiness review is now complete. It was conducted by a team of experts in the fields of science and engineering.

The technologies reviewed were the Atomic Vapor Laser Isotope Separation, AVLIS, process being developed by the Lawrence Livermore National Laboratory, LLNL, and the Molecular Laser Isotope Separation, MLIS, process under development at the Los Alamos National Laboratory or LANL.

The review team held its initial meeting on January 27, 1986, in Washington, D.C. Briefings on the AVLIS and MLIS processes were held February 17-19, 1986, at LLNL and February 26-28, 1986, at LANL, respectively. A final meeting of the review team was held on March 17-19, 1986, at the Department of Energy's Germantown, Maryland, offices. The review team issued it's report on March 28, 1986.

Question: Please describe the process being used for this review and describe how it conforms with the requirements of the conference report.

Answer: In response to the requirements of the conference report, the Department assembled a team of experts to perform the Special Isotope Separation, SIS, process readiness review under the purview of Dr. Alvin Trivelpiece, Director of the Office of Energy Research. The review was directed by Mr. William J. Howard, former Executive Vice President of Sandia National Laboratories. Other team members were selected from the Department of Energy, DOE consultants, and the national laboratories and have expertise in fields related to production plant operations and engineering design, as well as the basic science relating to the SIS processes.

As stipulated in the conference report, the review was focused on examining the readiness of the competing processes for plant deployment and identifying the process if any, that is most likely to achieve technical success and have the lowest operating and capital costs. Briefings were held on each of the two processes and allowed for structured peer review involving proponent and opponent presentations by each process development laboratory. A summary meeting was held to allow representatives for each process to address any outstanding questions or concerns expressed at the previous review meetings and to make their summary presentations to the review team. The review team report was submitted to DOE on March 28, 1986.

Question: Please describe the status of the Special Isotope Separation (SIS) process.

Answer: For the AVLIS process under development at LLNL, operation of the first set of plant prototype lasers has been initiated in the Laser Demonstration Facility. Construction is continuing on the Engineering Demonstration System, which is a prototypic installation of plutonium separators to be tested in FY 1987 and FY 1988. Work is also continuing on the balance-of-plant pyrochemical processes. These laser systems, separators, and plutonium processes are plant-scale demonstrations and their successful operation will provide the data needed should it be decided to proceed with plant construction and operation.

For the MLIS process under development at LANL, plutonium operations were started this year in the SIS-III facility. Initial isotope separation experiments are scheduled for the third quarter of FY 1986. The SIS-III facility contains a continuous gas flow loop in which the important parameters of the MLIS process can be demonstrated.

Question: What is the funding for this program in FY 1985, FY 1986, and FY 1987?

Answer: Funding levels for the two plutonium Special Isotope Separation, SIS, processes for FY 1985, FY 1986, and FY 1987 follows:

Plutonium Special Isotope Separation Funding
(Dollars in Millions)

	FY 1985	FY 1986	FY 1987
Atomic Vapor Laser Isotope Separation	$ 69.0	$ 75.0	$ 75.9
Molecular Laser Isotope Separation*	20.5	18.4	17.9
Special Isotope Separation Plant Proj.	0.0	3.8	0.0
Total	$ 89.5	$ 97.2	$ 93.8

---

*Funding for Molecular Laser Isotope Separation is contained in the appropriations for process development and is not included under the SIS program.

Process Facility Modifications

Question: Please describe the progress on the Process Facility Modification at Richland, Washington. Please describe the need for this facility.

Answer: The proposed Process Facility Modifications facility design is currently 30 percent complete. A draft environmental impact statement, analyzing the potential environmental effects that may result from the construction and operation of the facility, has been completed and is expected to be released for public review and comment in May 1986. Facility construction is scheduled to begin in early CY 1987.

Uranium Enriching

Question: Please justify the requirement to increase the funding for Uranium Enrichment. Please indicate how much of this funding is for working inventory of the Uranium Enrichment enterprise.

Answer: Additional separative work is required to provide enriched material for the N Reactor at Richland and for the Naval Reactors program.

A total of $190 million, or an increase of $29.6 million, is needed to support Naval fuel fabrication at both Nuclear Fuel Services at Erwin, Tennessee and at the Savannah River Plant Fuel Materials Facility. NFS has a contract to fabricate fuel at full production for about 2 more years. The Naval facility at Savannah River will reach full production in FY 1987. Savannah River needs to be operated at capacity to qualify the facility and to build fuel inventories which are needed as a protection measure against problems like the protracted strike at NFS.

The N Reactor requirements are dependent on the amount of fuel recycled from Richland to the Feed Material Production Center, FMPC, at Fernald. A total of $14.5 million, or an increase of $5.3 million above FY 1986 is required to meet N Reactor requirements.

No funds are included in the budget for uranium working inventories.

Report on Special Nuclear Materials

Question: Please describe the results of the recent review of the Materials Production program required by Armed Services authorization legislation.

Answer: The Report to the Committees on Armed Services of the Senate and House of Representatives detailed military requirements and sources of special nuclear materials through FY 1991. During FY 1986-FY 1991, DELETED warheads and bombs are projected to be produced by the Department of Energy and delivered to the Department of Defense based on Gramm-Rudman-Hollings budgetary constraints.

DELETED

The Department of Energy can marginally meet these requirements if no major operational problems occur and adequate funding is available.

DELETED

Question: Please describe the status of the Plasma Separation Process.

Answer: The original mission for the Plasma Separation Process, PSP, was the separation of U-236 from the highly enriched uranium driver fuel used in the Savannah River Plant reactors. Based on cost, need, benefit, and fiscal constraints, this mission was indefinitely deferred. Subsequent to this, a potential use for PSP was identified, by the contractor, of separating nickel isotopes for nuclear isotope power supplies. A preliminary analysis of this mission by DOE found little need for the nickel. Based on the interest that the Congress has shown in the nickel mission and in PSP in general, DOE is reevaluating the nickel mission and the PSP program.

Environmental Project Funding

Question: Please provide a table showing the total funding for environmental projects included in the Nuclear Materials Production budget by location for FY 1985, FY 1986, and FY 1987.

Answer: Funding for environmental projects included in the Nuclear Materials Production budget is as follows:

Environmental Projects
Nuclear Materials Production
(B/A in Millions)

	FY 1985	FY 1986	FY 1987
Idaho			
General Plant Projects	$ 0.0	$ 0.0	$ 0.3
Oak Ridge			
General Plant Projects	0.1	0.9	0.0
83-D-146 Water Pollution Control	4.1	0.0	0.0
87-D-159 Environmental, Safety, and Health Improvements	0.0	0.0	10.0
Richland			
General Plant Projects	0.0	0.7	1.5
Plant Engineering & Design	0.3	0.0	0.0
87-D-149 Reduced Chemical Discharges to Process Sewers	0.0	0.0	3.2
87-D-150 Effluent Treatment Facility	0.0	0.0	4.0
Savannah River			
General Plant Projects	1.4	1.9	1.5
81-D-143 L Reactor Upgrade	15.0	0.0	0.0
83-D-147 Pollution Discharge Elimination	1.3	0.0	0.0
83-D-148 Non-Radioactive Hazardous Waste Management	9.5	1.7	0.0
86-D-154 Effluent Treatment Facility	0.0	8.6	15.7
87-D-152 Environmental Protection Plantwide	0.0	0.0	1.5
87-D-156 Reactor Effluent Thermal Mitigation	0.0	0.0	5.0
Total Environmental Projects	$ 31.7	$ 13.8	$ 42.7

Reactor Operations

Question: Within reactor operations, provide the FY 1985, FY 1986, and FY 1987 budgets for Oak Ridge, Richland, and Savannah River. Please provide a breakdown of the activities at each location and justify the change from FY 1986 to FY 1987 in terms of quantifiable product.

Answer: A breakdown of reactor operations funding and program deliverables follows:

Reactor Operation Funding
(B/A in Millions)

	FY 1985	FY 1986	FY 1987
Oak Ridge	$ 65.6	$ 73.7	$ 87.7
Richland	171.2	177.8	205.3
Savannah River	267.6	288.0	322.7

Program Deliverables
Materials Production

	Unit of Measure	FY 1986	FY 1987
Reactor Operations			
Feed Material Production			
Slightly Enriched Uranium Billets for N Reactor	MTU	1,175	1,100
Depleted Uranium (DU) Cores for SR	MTU	1,740	2,080
Normal Uranium Cores for SR	MTU	370	340
DU Debries to Y-12			
Conversion of Highly Enriched Uranium (HEU) at Y-12		DELETED	
HEU Shipped to SR			
Enriched Lithium Compounds			
Savannah River Reactors (P, C, K, L)			
Reactor Days Operation	Days	954	1,117
Tritium Production		DELETED	
Plutonium-239 Production			
Fuel and Target Element Production			
Target Tubes		3,280	4,150
Fuel Tubes		4,000	4,500
Housings		10,480	8,100
Slugs		210,000	213,000
N Reactor			
Reactor Days Operation	Days	170	194
Plutonium Production	kgs	533	609
Steam Revenues	\$ X 10^6	36.7	54.4
Fuel Fabrication	MTU	830	830
Total Material Produced			
Plutonium-239		DELETED	
Tritium			

Processing of Nuclear Materials

Question: Within processing of Nuclear Materials, provide the FY 1985, FY 1986, and FY 1987 budgets for Savannah River, Richland, Idaho Falls, Oak Ridge, Los Alamos, Livermore, and Santa Susana. Please provide a breakdown of the activities at each location and justify the change from FY 1986 to FY 1987.

Answer: The processing account increases by 7.5 percent from FY 1986 to FY 1987. Of the increase, 5 percent is for inflation. The remaining 2.5 percent in growth is for the increased throughput required at these processing facilities. A breakdown of processing funding and of quantities to be processed for the period requested is as follows:

Nuclear Materials Production
Program Deliverables
Processing of Nuclear Materials
FY 1986-1987

	Measurement	FY 1986	FY 1987
Idaho			
Krypton-85 Recovered	Curies	20,000	50,000
Uranium-235	Kilograms	DELETED	
Savannah River			
Plutonium	Kilograms	DELETED	
Highly Enriched Uranium	Kilograms	5,868	7,457
Richland			
Plutonium through PUREX	Kilograms	DELETED	
Plutonium through PRF	Kilograms		
Los Alamos Processing			
Plutonium Oxide to Metal	Kilograms	DELETED	
Plutonium from Scrap	Kilograms		
Total Nuclear Materials Recovered*			
Plutonium	Metric Tons	DELETED	
Tritium	Kilograms		
Highly Enriched Uranium	Metric Tons	5.9	7.5

---

* Some material is processed twice during any one year, e.g., PUREX fuel grade plutonium oxide is processed at Richland and blended at Savannah River.

Nuclear Materials Production
Analysis of Processing Account
(Budget/Authority in Millions)

Site	Activities	FY 1985	FY 1986	FY 1987
Los Alamos	Oxide Recovery	$12.3	$12.6	$ 5.0
	Plutonium Scrap Recovery	8.6	9.3	5.0
	Technology Development/Exchange	0.0	2.8	3.0
	Molecular Fluor./Safety Studies*	1.7	0.0	0.0
		$22.6	$24.7	$15.0
Chicago	Experimental Breeder Reactor Fuel Shipments	$ 1.0	$ 0.3	$ 0.8
Idaho	Environmental	$ 3.5	$ 3.8	$ 3.9
	Safeguards and Security	3.5	4.1	4.2
	Naval Fuels & Non-Production Fuels	46.9	51.2	56.9
	Idaho Restoration	4.5	5.0	6.2
	ROVER Fuels Processing	1.1	0.0	0.0
		$59.5	$64.4	$72.0
Oak Ridge	Uranium Scrap Processing	$ 1.0	$ 1.7	$ 1.8
	Uranium Recovery from R&D Programs	0.5	1.1	1.2
	Californium-252 Recovery	0.0	1.8	2.0
		$ 1.5	$ 4.6	$ 5.0
Richland	Process Facility Modification**	$ 8.2	$ 0.0	$ 0.0
	PUREX Operations	62.0	68.9	76.3
	Environmental	0.0	0.8	0.0
	Safeguards and Security	15.1	11.5	16.5
	Plutonium Scrap	26.1	34.0	34.7
	Special Isotope Separation	14.0	9.7	8.8
		$125.4	$124.9	$136.3
Santa Susana	Non-Production Fuels Decladding	$ 5.4	$ 6.0	$ 5.2
Livermore	Special Isotope Separation	$46.0	$60.4	$41.1
Savannah River	Environmental	$ 5.7	$ 6.4	$ 6.4
	Safeguards and Security	14.9	18.8	15.4
	Processing of Reactor Fuels	115.2	117.2	135.4
	Fuels Reduction to Metal	31.0	32.0	33.4
	Non-Production Scrap Recovery	1.5	1.3	1.6
	Special Recovery Facility Operations	3.2	4.1	8.0
		$171.5	$179.8	$200.2
Headquarters	Special Isotope Separation	$	$ 0.0	$ 25.0
Total Processing of Nuclear Materials		$432.9	$464.8	$499.8

---

* Funding provided in Support Services in FY 1986.

**Funding transferred to Support Services in FY 1986-1987.

Supporting Services

Question: Within supporting services, provide the FY 1985, FY 1986, and FY 1987 budgets for each location. Please provide a breakdown of the activities at each location and justify the change from FY 1986 to FY 1987.

Answer: Supporting services is an integral portion of our budget and contains activities essential to maintain production operations for a program as large as the Nuclear Materials Production program. If you take into consideration escalation at 5 percent, our supporting services program growth actually decreases by approximately $10 million. A breakdown of supporting services funding and a listing of essential activities by location for the years requested follows:

Nuclear Materials Production
Analysis of Supporting Services
(B/A in Millions)

Site	Activities	FY 1985	FY 1986	FY 1987
AL	Molecular Laser Isotope Separation Program	$ 18.6	$ 17.8	$ 16.8
	Safety Studies	2.5	3.2	2.7
	Molecular Fluorination Development	0.0	1.0	0.0
	Robotics Development	1.0	1.0	1.3
	Software Development	0.1	0.3	0.1
	Chemical Isotope Separation	0.3	0.2	0.0
		$ 22.5	$ 23.5	$ 20.9
ID	Fast Startup	$ 9.6	$ 0.0	$ 0.0
	Other Startup Costs	1.3	2.1	1.6
	New Production Reactor	1.0	0.2	0.0
	Conceptual Engineering/Design	1.7	0.8	1.0
	Inventories	1.4	0.9	0.8
	Safeguards and Security	0.4	0.0	0.1
	Miscellaneous	0.7	0.1	0.0
		$ 16.1	$ 4.2	$ 3.5
OR	Startup, Shutdown, Standby	$ 0.4	$ 0.4	$ 4.7
	Transportation and Shipments	0.6	0.6	0.8
	Weapons Production Support	9.4	17.0	20.0
	Process Development	3.7	0.6	2.4
	Conceptual Engineering	3.8	2.6	2.8
	NLO Contract Phaseout	0.0	1.5	0.8
	Uranium-233 Processing	6.4	6.2	5.1
	Safeguards and Security	0.0	1.1	1.6
	Inventories	0.2	0.3	0.5
	Motor Rewinding-GAT	2.0	2.0	2.0
	Miscellaneous	0.5	0.0	0.6
		$ 27.0	$ 32.3	$ 41.3
RL	Startup, Shutdown, Standby	$ 3.8	$ 2.0	$ 2.1
	Facilities Restoration	1.6	1.1	0.0
	Tritium Research and Development	0.0	3.0	0.0
	Process Development	0.8	1.0	0.7
	Conceptual Engineering	4.9	1.1	2.9
	Process Facility Modifications	1.3	6.5	11.2
	Site Cleanup	0.1	0.6	0.0
	Retirement and Disability	1.1	1.5	1.3
	Nuclear Materials Management	3.5	5.5	3.8
	T Plant Operation	1.3	2.5	2.5
	Safeguards and Security	17.0	13.1	15.5
	Inventories	1.0	3.2	3.0
	Environmental	1.8	0.0	0.0
	Miscellaneous	1.1	0.3	0.0
		$ 39.3	$ 40.5	$ 43.0

Site	Activities	FY 1985	FY 1986	FY 1987
SAN	Plasma Separation Process	$ 20.0	$ 18.2	$ 0.0
	Miscellaneous	0.0	0.4	0.0
		$ 20.0	$ 18.6	$ 0.0
SR	Startup, Shutdown, Standby	$ 2.4	$ 0.6	$ 0.5
	Facilities Restoration	8.4	1.8	0.0
	Process Development	32.5	26.5	40.4
	Fuel Improvements Program	2.1	0.0	0.0
	Environmental/Site Cleanup	62.1	36.5	27.1
	Conceptual Engineering	17.0	16.6	19.6
	Safeguards and Security	13.0	11.8	16.9
	Long Range Planning	2.0	2.3	2.4
	Warehousing	0.5	0.4	0.5
	Change in Inventories	4.6	8.1	16.0
	Miscellaneous	1.8	9.7	18.4
		$ 146.4	$ 114.3	$ 141.8
HQ/ CH	New Production Reactor	$ 3.0	$ 3.5	$ 0.0
	Plasma Separation Process	0.0	6.8	0.0
	Miscellaneous	1.7	6.2	2.0
		$ 4.7	$ 16.5	$ 2.0
Total Supporting Services		$ 276.0	$ 249.9	$ 252.5

Funding by Location

Question: Please provide a table showing total funding at the various locations supported by Nuclear Materials Production for FY 1985, FY 1986, and FY 1987. Please identify separately each construction project.

Answer: Funding by location for the Nuclear Materials Production program is as follows:

Nuclear Materials Production
(In Millions of Dollars)

	FY 1985	FY 1986	FY 1987
Albuquerque			
Operating Expenses	$ 46.9	$ 49.9	$ 36.0
Capital Equipment	5.2	4.2	3.0
Construction			
General Plant Projects	1.1	0.9	0.9
Total Albuquerque	$ 53.2	$ 55.0	$ 39.9
Idaho			
Operating Expenses	$ 78.5	$ 70.3	$ 77.7
Capital Equipment	10.9	10.0	10.2
Construction			
General Plant Projects	4.5	4.0	4.2
84-D-137, Facility Security System Upgrade	5.0	4.7	0.3
85-D-139, Fuel Processing Restoration	10.0	13.5	35.0
82-D-128, Plant Perimeter Security Systems Upgrade	0.4	0.0	0.0
82-D-136, Fuel Processing Facility Upgrade	1.0	0.0	0.0
Prior Year Projects	(0.4)	0.0	0.0
Subtotal Construction	$ 20.5	$ 22.2	$ 39.5
Total Idaho	$ 109.0	$ 102.5	$ 127.4
Oak Ridge			
Operating Expenses	$ 236.9	$ 282.3	$ 340.7
Capital Equipment	11.6	15.7	29.6
Construction			
General Plant Projects	1.5	4.7	6.0
87-D-159, Environmental Improvements, FMPC	0.0	0.0	10.0
86-D-149, Productivity Retention Program	0.0	6.6	21.8
85-D-140, Productivity and Radiological Improvements, FMPC	3.0	15.0	23.5
84-D-136, Enriched Uranium Conversion Facility Modification (Y-12)	4.4	12.2	3.0
83-D-146, Water Pollution Control, FMPC	4.1	0.0	0.0
82-D-124, Restoration of Production Capabilities, Phases II-V	5.7	0.0	0.0
Subtotal Construction	$ 18.7	$ 38.5	$ 64.3
Total Oak Ridge	$ 267.2	$ 336.5	$ 434.6

Nuclear Materials Production
(In Millions of Dollars)

	FY 1985	FY 1986	FY 1987
Richland			
Operating Expenses	$ 335.8	$ 343.0	$ 384.6
Capital Equipment	24.7	22.4	30.7
Construction			
General Plant Projects	8.9	8.0	8.7
Plant Engineering and Design	1.7	0.0	0.0
87-D-149, Reduced Chemical Discharges to Process Sewers	0.0	0.0	3.1
87-D-150, Effluent Treatment Facility (Design-Only)	0.0	0.0	4.0
86-D-149, Productivity Retention Program	0.0	3.1	17.7
86-D-150, In-Core Neutron Monitoring System, N Reactor	0.0	5.1	2.1
86-D-151, PUREX Electrical System Upgrade	0.0	2.4	3.9
85-D-136, Components Protection System	3.3	0.0	0.0
85-D-137, Vault Safety SNM Inventory System	2.5	1.9	0.0
84-D-135, Process Facility Modifications	10.0	14.5	35.0
82-D-124, Restoration of Prod. Capabilities, Phases II-V	8.7	1.1	0.0
82-D-126, Reactor Safety & Reliability	5.5	1.8	0.0
Prior Year Projects	(2.2)	(1.6)	0.0
Subtotal Construction	$ 38.4	$ 36.3	$ 74.5
Total Richland	$ 398.9	$ 401.7	$ 489.8
San Francisco			
Operating Expenses	$ 71.4	$ 85.0	$ 46.3
Capital Equipment	8.0	4.5	1.0
Construction	0.0	0.0	0.0
Total San Francisco	$ 79.4	$ 89.5	$ 47.3
Savannah River			
Operating Expenses	$ 602.6	$ 601.4	$ 682.0
Capital Equipment	42.8	50.4	50.6
Construction			
General Plant Projects	14.2	13.3	15.1
87-D-152, Environmental Protection Plantwide	0.0	0.0	1.5
87-D-156, Reactor Effluent Thermal Mitigation	0.0	0.0	5.0
86-D-149, Prod. Retention Program	0.0	9.9	36.8
86-D-152, Reactor Elec. Dist. Sys.	0.0	2.7	7.7
86-D-153, Additional Line III Tritium Furnace	0.0	1.8	7.3
86-D-154, Effluent Treatment Facility	0.0	8.6	15.7

	FY 1985	FY 1986	FY 1987
86-D-156, Plantwide Safeguard Systems	$ 0.0	$ 2.7	$ 13.9
86-D-157, Hydrofluorination System, FB-Line	0.0	2.0	2.5
85-D-145, Fuel Production Facility	5.8	18.0	35.5
84-D-130, Mod. Processing Facility Substations	0.2	0.0	0.0
84-D-134, Safeguards and Security Improvements Plantwide	13.5	6.3	14.7
83-D-148, Non-Radioactive Hazardous Waste Management	9.5	1.7	0.0
83-D-180, Facility Storage Mods.	3.4	0.0	0.0
82-D-124, Restoration of Production Capabilities, Phases II-V	58.3	38.5	7.8
82-D-126, Reactor Safety and Reliability	5.8	0.0	0.0
82-D-127, Safeguards Improvements	12.9	0.0	0.0
82-D-201, Special Plutonium Recovery Facilities, JB-Line	42.4	4.4	0.0
81-D-143, L Reactor Upgrade	15.0	0.0	0.0
Prior Year Projects	0.3	(1.8)	0.0
Subtotal Construction	$ 182.9	$ 108.1	$ 163.5
Total Savannah River	$ 826.7	$ 759.9	$ 896.1
Headquarters and Miscellaneous			
Operating Expenses	$ 8.8	$ 14.9	$ 29.0
Capital Equipment	0.9	2.2	1.0
Construction			
General Plant Projects	0.3	1.0	1.0
Prior Year Projects	0.0	1.1	0.0
86-D-148, Special Isotope Separation Plant	0.0	3.8	0.0
Subtotal Construction	$ 0.3	$ 5.9	$ 1.0
Total Headquarters and Misc.	$ 9.9	$ 23.0	$ 31.0
Total Nuclear Materials Production	$1,745.3	$1,768.1	$2,066.1

Thermal Mitigation Project at Savannah River

Question: Describe the needs that are to be met by the requirements of project 87-D-156, Reactor Effluent Cooling Water Thermal Mitigation.

Answer: The major sources of thermal effluents at the Savannah River Plant are the cooling water discharges from the production reactors, C and K, and the D Area coal-fired powerhouse. Although the production reactors have operated for approximately 30 years, at present, the discharge from these facilities do not meet the temperature limits prescribed by the State of South Carolina's standards. The Department of Energy has developed this project to enable operations to comply with these standards and to meet the requirements of a Consent Order between DOE and the State of South Carolina's Department of Health and Environmental Control.

Question: What is the total cost of project 87-D-156?

Answer: The total project cost for project 87-D-156 is $109 million.

Question: What cost/benefit analysis has been performed on requirements of project 87-D-156?

Answer: The Department of Energy has performed a cost benefit study and has published the results which describe the systems which can best implement compliance with the water quality standards. As a result, DOE is considering the construction and operation of once-through cooling towers for C and K Reactors and implementation of increased coolant flow with mixing for the D Area powerhouse.

Question: What alternative measures have been analyzed to the use of these cooling towers?

Answer: The Department of Energy has examined alternatives which improve on the existing situation and which either meet or fail to meet the full requirements of the existing standards. Of the alternatives which meet the standards, cooling lakes, recirculating cooling towers, once-through cooling towers, and combinations of these have been evaluated. Of the alternatives which would significantly improve thermal discharges but which would not meet the standards, DOE has examined spray canals, lakes, energy recovery systems, and combinations of these.

Question: What is the environmental impact on the Savannah River site of having the proposed cooling towers?

Answer: The proposed project will require 1,125 to 1,600 acres of land. This includes flooding of 700 to 815 acres of upland hardwoods and pines under the new holding ponds. The equivalent of 50,000 barrels of crude oil will be consumed each year to power the fans and pumps to be installed. There will also be increased fogging due to the moisture discharged into the atmosphere by the towers.

Reprogrammings

Question: Please provide a list of all reprogrammings that are included in the Department's budget for all programs under the jurisdiction of the Energy and Water Development Appropriations Subcommittee.

Answer: The information is shown on the following insert for the record.

(The information follows:)

Reprogrammings/Notifications Referenced In The FY 1987 Budget Justifications (Dollars in Thousands)

	FY 1986		
	Present	Change	Revised
Technical Information Management Program (TIMP)			
(Energy Supply R&D)			
In-House Energy Management.....	$ 12,734	$ -7,923	$ 4,811
TIMP..........................	10,000	+7,923	17,923*

*Of this amount $3,923,000 will be deferred until FY 1987.

This reprogramming will offset funding shortfalls in both FY 1986 and FY 1987 for the TIMP. The primary goals of the TIMP are (1) to ensure cost effective and efficient management, control, and accountability of DOE funded research results, and (2) to obtain worldwide energy R&D results for use by DOE and U.S. scientists, engineers, and program managers. As a part of the overall Departmental program, TIMP is responsible for the management, control, and dissemination of classified and sensitive materials produced in its DOE R&D programs.

Baseline Environmental Survey

(General Science & Research)			
High Energy Physics			
Facility Operations (OE)............	$ 175.295	$ -200	$ 175,095
Nuclear Physics			
Medium Energy Physics (OE)..........	73,191	-60	73,131
Heavy Ion Physics (OE)..............	50,190	-40	50,150
Subtotal, General Science.......	$ 298,676	$ -300	$ 298.376
(Uranium Enrichment Activities)			
Gaseous Diffusion (OE)...............	$1,043,313	$ -250	$1,043,063
Weapons Activities			
Production & Surveillance (OE)......	$1,743,589	$-3,800	$1,739,789
Materials Production			
Reactor Operations (OE).............	542,615	-1,517	541,098
Defense Waste			
Interim Waste Operations (OE).......	262,521	-300	262,221
Subtotal, Atomic Energy Defense...	$2,548,745	$-5,617	$2,543,108
(Energy Supply R&D)			
Environment, Safety, and Health.......	$ 37.338	$+7,617	$ 44.955

This program involves a baseline environmental survey of approximately 40 DOE sites. These sites have an estimated total of 600 inactive waste areas, 300 hazardous waste management areas, 1,800 air emission stacks, and 400 wastewater outfall pipes. The survey will cover air, water, and soil, and all areas of environmental regulation. The survey will begin in FY 1986 with 5 sites, an additional 20 in FY 1987, and the remainder in FY 1988.

	1986		
	Present	Change	Revised
Uranium Enrichment			
AVLIS R&D - Oak Ridge National Lab - Continuing Program	17,300	-17,300	-0-
AVLIS R&D - Oak Ridge National Lab - Phase Out Program	-0-	+17,300	17,300 a/

The AVLIS R&D at Oak Ridge National Lab, centered principally around operation of the Materials Handling Development Module (MHDM), is being phased out in FY 1986 and the residual R&D, along with approximately 30-40 personnel, will be transferred to Lawrence Livermore National Lab. The work will be consolidated with LLNL activities in preparation for the transfer to the private sector during the FY 1988-89 period. The MHDM will be decontaminated and decommissioned with FY 1986 funds.

a/This is the total amount of funding at OR for this program however, the facility will be operated for a part of the year and the specific amount for D&D and phase out has not yet been determined.

FY 1987 Changes

Oak Ridge Disposal Activities Funding Changes	FY 1987		
	Present	Change	Revised
86-D-173 Central Waste Disposal Facility, OR	$ 949*	$ -949	$ 0
Interim Waste Operations, Operating Expenses	324,730	+949	325,679

The changes reflect the Department's plan to terminate the use of hydrofracture to dispose of liquid low-level waste at Oak Ridge, Tennessee. The termination of hydrofracture is in response to recently revised regulations by the state of Tennessee. In addition, the Department plans to redirect other FY 1986 low-level waste disposal operating expense funded activities within the Interim Waste Operations subprogram in an effort to identify and implement technically and environmentally acceptable low-level waste disposal options at Oak Ridge (refer to volume I, pages 555, 556, 569 and 572 of the FY 1987 Budget Request).

Richland Tank Farm	Present	Change	Revised
82-N-104 Waste Transfer Facilities, RL	$ 67*	$ -67	$ 0
82-N-107 Rail Replacement, RL	550*	-550	0
83-D-157 Additional Radioactive Storage Tanks, RL	583*	-583	0
87-D-174 241-AQ Tank Farm, RL	2,100	+1,200	3,300

The prior year projects were completed under cost. These adjustments are necessary to provide adequate first year funding to maintain the required schedule for design and construction of four high level waste storage tanks. These new tanks, which have a TEC of $58 million, will be completed in the early 1990's (refer to Volume I, pages 569, 571).

Richland Central Warehouse Upgrade	Present	Change	Revised
83-D-157 Additional Radioactive Waste Storage Tanks, RL	$ 4,200*	$ -4,200	$ 0
85-D-158 Central Warehouse Upgrade, RL	1,300	+4,200	5,500

This project provides for a new warehouse at Richland to replace a dilapidated, thirty-year old structure. The use of underrun funds for this $13 million project will restore its funding, which was reduced by budget constraints, to cover planned costs for FY 1987 (refer to Volume I, pages 569, 573).

---

*Unobligated balances beginning FY 1987.

Question: What is the environmental impact of the Savannah River reservation of not having the proposed cooling towers?

Answer: The no-action alternative would result in the continuation of thermal discharge effects. The high water temperatures would continue as it has over the last 30 years to prevent fish, such as minnows, darters, sunfish, and blueback herring from using affected streams for foraging or spawning and, in particular, would not permit compliance with the State of South Carolina's water and temperature standards. There would be no impacts on air quality or noise or on archeological sites with this alternative.

Waste Isolation Pilot Plant

Question: What is the status of the Waste Isolation Pilot Plant project?

Answer: Construction of the Waste Isolation Pilot Plant is progressing exceptionally well. The originally planned construction packages are about 90 percent complete. Both underground and above-ground facilities are under construction, and we expect the originally planned construction to be completed in early FY 1987. The availability of prior year construction funds will meet our FY 1986 and FY 1987 needs; therefore, no construction funds have been requested for these years. Detailed operational planning and environmental reviews have determined that additional construction could be required to complete a safe and operable, first-of-a-kind research and development facility. The timing and cost of additional construction will be addressed during development of the FY 1988 budget.

Question: What is your latest estimate of the total cost for this project?

Answer: The total estimated construction cost is $417.3 million, the total project cost is $693.4 million, which includes operating funded support activities.

Question: What is the current position of the State of New Mexico with regard to construction of the Waste Isolation Pilot Plant?

Answer: Our relationship with the State of New Mexico is improving. Issues of concern to the State are being actively negotiated within the framework of the Consultation and Cooperation Agreement. One primary State concern has been the mission of the Waste Isolation Pilot Plant, WIPP. The Department of Energy's mission is limited to the demonstration of transuranic waste disposal and experiments with high-level waste. We want to emphasize that the WIPP facility is not being designed for permanent disposal of high-level waste. We signed an amendment to the Consultation and Cooperation Agreement last year, which included the WIPP mission as described above; and copies were provided to the appropriate committees of Congress for their information.

Question: Describe the need to increase operating funds as you transition the WIPP site from construction to operations.

Answer: As facilities and equipment are completed, they are turned over to the operations program. The construction project is now about 90 percent complete. Activities such as preoperational testing, startup and checkout, training activities, and mining for the demonstration phase will be carried out in FY 1987 with operating funds in preparation for the planned receipt of waste in October 1988. In addition, certain support activities, such as security, environmental monitoring, and various other project support activities will now be continued and funded with operating funds with the completion of construction.

Question: What is the total FY 1986 and FY 1987 operating cost of the WIPP project?

Answer: The operating costs for the WIPP projects will be approximately $24,000,000 in FY 1986 and $39,100,000 in FY 1987. It will continue to increase as startup and full-scale operations occur.

Defense Waste Processing Facility

Question: What is the status for the Defense Waste Processing Facility (DWPF)? What is the TEC and costs remaining to completion?

Answer: The DWPF is on schedule with design 92.7 percent complete, procurement 64.6 percent complete, and construction 51.5 percent complete. Hot startup is scheduled for FY 1990.

The total estimated cost is $870 million; the latest estimate of the remaining costs to be appropriated are shown below:

	FY 1987	FY 1988	FY 1989
Project Funding ($M)	$ 135.0	$ 109.0	$ 39.5

Question: Please describe your preoperational activities in support of Defense Waste Processing Facility at Savannah River.

Answer: The Defense Waste Processing Facility, DWPF, will immobilize the salt and sludge, now in interim storage in tanks, in preparation for its disposal. The DWPF consists of two plants - the vitrification plant and the saltstone plant. The vitrification plant, which will begin operation in FY 1990, will solidify the sludge in borosilicate glass for disposal offsite at a Federal repository. The saltstone plant, which will begin operation in FY 1988, will incorporate decontaminated salt in concrete.

The preoperational activities are necessary to prepare for the operation of these plants. Operating personnel must be trained and operating procedures must be written and tested. Equipment must be inspected and calibrated. Chemicals, materials, and parts must be ordered and stockpiled. Subsystems are checked as installed, and nonradioactive chemical process checkouts are carried out to thoroughly verify operability. Analytical methods are selected and tested. Emergency preparedness procedures are prepared and tested. The sequential turnover of subprojects from construction to operations will culminate in a smooth transition to radioactive DWPF operations.

Question: What is the total cost in FY 1987 of this preoperational support of Defense Waste Processing Facility?

Answer: There are three areas of preoperational support activity, i.e., saltstone operations support, vitrification operations support, and laboratory operations support. The funding breakdown for this support follows:

FY 1987 DWPF Preoperational Costs
(Dollars in Thousands)

	Operating	Capital Equipment	GPP	Total
Saltstone	$ 7,570	$ 200	$ 100	$ 7,870
Vitrification	15,450	820	270	16,540
Laboratory	3,080	370	130	3,580
Total	$ 26,100	$ 1,390	$ 500	$ 27,990

Question: Please describe the scheduled start up of the DWPF Saltstone facility.

Answer: The disposal and processing environmental permits for Defense Waste Processing Facility saltstone are expected to be received from the South Carolina Department of Health and Environmental Control in September 1986. Construction on the processing facility is expected to begin in October, followed in November with the construction of disposal facilities. Full-scale saltstone production is expected to start in FY 1988.

Waste Transfer Program

Question: Please describe the status of the waste transfer program at Richland, Savannah River, and Idaho.

Answer: In January 1981, Richland completed the transfer of all free-standing liquid from its 149 old single-shell tanks to new double-shell tanks. Hanford then began the Stabilization and Isolation Program. The objective of this program is to stabilize the single-shell tanks by transferring all remaining drainable liquid to double-shell tanks and to isolate the old tanks by separating all unnecessary piping connections to prevent inadvertent liquid intrusion.

By the end of FY 1986, 93 of the old tanks will be stabilized and 85 will be isolated. Due to a critical shortage of double-shell tank space, the Stabilization and Isolation Program is being performed at a minimal level. The rate is limited to pumping a total of 1 million gallons of liquid from the single-shell tanks until double-shell tanks are available in FY 1992. The Stabilization and Isolation Program is scheduled to be completed in FY 1994.

At Savannah River, the objective of the waste transfer program is to remove the waste from the 23 old high-level waste storage tanks and transfer it to new ones, and prepare feed for the Defense Waste Processing Facility vitrification and saltstone plants.

First priority is the removal of waste from the seven single-shell tanks. This will be completed in FY 1986. All the other tanks have secondary containment. Removal of waste from all the old tanks will be completed in FY 1994. Feed preparation is on schedule for saltstone startup in FY 1988, and vitrification startup in FY 1990.

At Idaho, there is no waste transfer program because liquid wastes are routinely calcined to a dry, granular solid and stored in underground bins.

High-Level Waste Tanks

Question: How many new tanks are funded at each site, what is the cost of each tank, and what is the requirement for new tanks beyond those funded to date?

Answer: High-level waste (HLW) is managed at Hanford, Idaho, and Savannah River.

At Hanford, funding for eight conventional double-shell HLW storage tanks under project 83-D-157 (AP tank farm) was completed in FY 1985. The total estimated cost (TEC) of this project was $49,155,000. Funding for four new aging waste (i.e., high heat HLW) storage tanks is requested in FY 1987 under project 87-D-174 (AQ tank farm). The TEC of this project if $57,300,000. Aging waste storage tanks cost more than conventional tanks because of the additional requirements for cooling, seismic and other criteria, and backup power supplies. The requirement for four additional conventional HLW storage tanks is considered for FY 1988. Methods to reduce the volume of waste generated are being evaluated. Assuming planned facilities are available to process and immobilize the waste stored in tanks, no new tanks should be required after the FY 1988 request.

At Idaho, the present tank inventory is considered to be adequate to meet future requirements because the backlog of liquid waste is routinely calcined to a dry, granular solid for storage in bins. New Calcined Solids Storage Facilities are required about every 3 to 4 years.

At Savannah River, no additional tanks will be required since the Defense Waste Processing Facility, to immobilize waste removed from tanks and prepare it for disposal in a repository, it is expected to be in operation in FY 1990.

Question: What problems do you still encounter with leaking tanks at each site?

Answer: None of the tanks or calcined solids storage bins at Idaho or the new high-integrity double-shell tanks at Hanford or Savannah River has leaked.

Of the 149 old single-shell tanks at Hanford, 7 are classified as "assumed leakers." This is a conservative term which is defined as "a tank for which there is an indication of a breach of integrity. Such a tank exhibits surveillance parameter changes that exceed stated criteria limits and result in a less than 95 percent confidence that it is sound." Of the remaining 142 old single-shell tanks, 49 are sound, deactivated tanks and 93 are classified as "stabilized," meaning that the pumpable liquid has been removed. Pumpable liquid is being removed from the old tanks and transferred to new high-integrity double-shell tanks as part of the Stabilization and Isolation program, which will complete all 149 old tanks 1994.

No significant amount of radioactive waste has been released to the environment from old waste tanks at Savannah River. There is, however, concern about leakage because of the age, condition, and design of the old waste tanks, which were built between 1952 and 1961. Of the 23 old waste tanks containing high-level waste, there are seven single-shell tanks, one of which has a crack in the wall above the liquid level. There has been a small amount of in-leakage of ground water through the crack. Sixteen of the old tanks are of "cup-and-saucer" design, which means that the tank sits in a 5-foot-high secondary containment. There has been leakage into the secondary containment in nine of these tanks. In one of the tanks, a leak of about 25 gallons did occur from the secondary containment to the surrounding soil in 1960. Thorough and continuing monitoring and tests have shown that the waste is confined to the immediate area of the tank. In all other cases, the waste has been collected from the secondary containment and returned to the tanks. Waste from the old tanks is being transferred to new high-integrity double-shell tanks as part of the tank replacement/waste transfer program, which will be completed in FY 1994.

DOE Waste Inventory

Question: Please provide a table listing the quantity and status of the various classes of nuclear waste at each site.

Answer: The Department manages three classes of nuclear waste at its sites: high-level waste (HLW), transuranic waste, and low-level waste.

High-level waste is stored in underground tanks at Hanford and Savannah River pending retrieval, immobilization in borosilicate glass, and ultimate disposal in a geologic repository. The Defense Waste Processing Facility, for the immobilization of HLW, is now under construction and is scheduled to operate in FY 1990. A facility to immobilize waste at Hanford is expected to operate in FY 1996. At Idaho, newly generated HLW is temporarily stored in underground tanks. The HLW is then routinely converted to a dry granular solid called "calcine," which is stored in underground bins. This material will be eventually prepared for disposal in a geologic repository in early 2000.

Since 1970, transuranic waste (TRU) has been stored pending retrieval, processing if necessary, certification, transportation to, and emplacement in the Waste Isolation Pilot Plant (WIPP). In 1985, the Department began to certify TRU, as it was generated, to meet the waste acceptance criteria of the WIPP. This waste is stored separately from previously generated TRU. Prior to 1970, TRU was disposed of as low-level waste (LLW). This waste is monitored, and remedial actions will be taken if needed.

LLW is disposed of in near-surface trenches using shallow land burial, or in deeper trenches or holes using greater confinement disposal. In some cases, the disposal facilities are lined or otherwise engineered to assure isolation from the environment. The method of disposal depends on the characteristics of the waste.

The following table shows the volume of each class of nuclear waste at the Department's sites as of December 31, 1984. Additional information can be obtained from the Department's annual report entitled, "Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics," DOE/RW-0006, December 1985.

DOE Waste Inventory*

Site	HLW	Stored TRU	Buried TRU	LLW
Los Alamos National Laboratory	0	6.5	11.5	179.8
Hanford Site	232.6	13.7	91.7	339.7
Idaho National Engineering Laboratory	10.1	54.2	57.1	130.3
Nevada Test Site	0	0.5	0	164.0
Oak Ridge National Laboratory	0	1.2	6.2	200.5
Feed Materials Production Center	0	0	0	297.9
Savannah River Plant	125.1	3.9	4.5	440.5
All Other	0	0	0	399.0
Total	367.8	80.0	171.0	2151.7

*Volume in thousands of cubic meters as of December 31, 1984.

Idaho Calcined Solids Storage

Question: What is the plan to construct a vitrification facility at Richland and Idaho. Describe the status of construction of the Calcined Solids Storage at Idaho?

Answer: Under current planning assumption, the Hanford Waste Vitrification Plant (HWVP) will be constructed at Richland starting in FY 1989 and is expected to be in operation by FY 1996. It will perform the same function as the vitrification plant of the Defense Waste Processing Facility (DWPF), which is currently under construction and is expected to begin hot operation in FY 1990. Maximum benefit is being gained by technology transfer from DWPF to HWVP.

Waste at Idaho is stored in immobile form, calcine, in facilities with a design life of 500 years. After DWPF and HWVP are in operation, decisions will be made on the final disposition of the calcined waste in storage bins at Idaho.

Physical construction of the seventh set of solids storage bins is expected to begin in July 1986. The present status of the project is design 97 percent complete and procurement 13 percent complete.

Hanford Waste Disposal

Question: Please explain how the B-Plant facility would affect plans for waste disposal and the timetable for the vitrification facility at Hanford.

Answer: B-Plant is an essential facility to prepare Hanford defense waste for disposal. The waste consists of liquid, sludge, and salt cake and is stored in large underground tanks. B-Plant will be used to separate Hanford defense waste into two streams. One stream, comprising over 90 percent of the waste volume, will consist of a decontaminated salt solution which will qualify as low-level waste. It will be incorporated in grout and disposed of by shallow land burial on site. The other stream, while relatively small in volume, will contain over 99 percent of the radioactivity. It will be delivered to the vitrification facility and incorporated in glass for subsequent disposal in a Federal repository.

Hanford Waste Vitrification Plant

Question: Please provide the funding provided for the Hanford Waste Vitrification Plant, HWVP, for FY 1984, FY 1985, FY 1986, FY 1987 and describe the activities funded. How much is anticipated in FY 1988, FY 1989, and thru FY 1994?

Answer: The following table provides the funding by fiscal year ($ in millions).

	FY 1984	FY 1985	FY 1986	FY 1987
Operating Expense	$ 3.0	$ 6.0	$ 9.1	$ 9.6

The activities funded are for process development, equipment development, and conceptual facility design. In the last 2 years, emphasis has been on technology transfer from the Defense Waste Processing Facility (DWPF) which is being built at Savannah River to perform a comparable function. DWPF is about 6 years ahead of HWVP so that vital experience is being obtained and incorporated in HWVP. Another important current activity is coordination with the Federal repository effort to assure acceptance of the HWVP product in the repository.

The following table provides the estimated funding for HWVP by fiscal year ($ in millions). These estimates are very tentative until conceptual design activities are complete.

	FY 1988	FY 1989	FY 1990-1996	Total
Construction	$ 15.0	$ 43.0	$ 572.0	$ 630.0
Operating Expenses	10.0	13.8	180.3	204.1

Question: What is the current plan for the initiation of construction for HWVP? (Include the estimated key dates and funding required over the construction period.)

Answer: The current plan is for a HWVP design-only project in FY 1988 and a construction project in FY 1989. The design-only project will provide for effort by the architect-engineer to refine the design and improve the cost estimate. The current estimated construction cost is $630 million. Key dates are:

Activity	Fiscal Year
Begin Design	1988
Start Construction	1989
Complete Design	1991
Complete Construction	1995
Hot Startup	1996

Question: How much funding is needed to complete pre-construction activities for HWVP and how quickly can pre-construction be completed with full funding in FY 1987?

Answer: The funding of $9.6 million is adequate for completion of conceptual design, which is a prerequisite for construction. Conceptual design is scheduled for completion in the first quarter of FY 1988 and could not be accelerated materially by additional funding.

Question: With funding in FY 1987 and beyond at your full capability, how soon could construction begin on HWVP?

Answer: The start of HWVP construction cannot be materially accelerated by increased funding in FY 1987.

Shuttle Disaster

Question: Please describe the impact of the recent disaster at the NASA program on the DOE verification and control program.

Answer: The Challenger disaster is not expected to have a significant effect on DOE's satellite instrumentation program. Instrumentation payloads are delivered by DOE to DELETED for integration and testing on the space vehicle, DELETED before scheduled launch. Schedules for delivery are DELETED based on projected launch dates. Consequently, any effect on DOE will depend largely upon how long the shuttle program has to stand down, and whatever action, if any, the DELETED regarding satellite production rates if shuttle launches are delayed for an extended period.

Inflation Allowance

Question: Please describe why there is no need for an allowance for inflation in the verification and control program.

Answer: A 5 percent allowance for inflation is included in the Verification and Control Technology (V&CT) program is FY 1987 budget request. This allowance, however, is not specifically identified as such in the summary table of changes, but is included in the major programmatic areas. Thus, the proposed changes from the FY 1986 adjusted appropriation represent a mixture of the 5 percent inflation allowance and program increases or decreases.

Verification and Control Technology Funding

Question: Please provide the funding for the various functions under Verification and Control in FY 1984, FY 1985, FY 1986 and FY 1987.

Answer: The functional breakdown of the Verification and Control Technology program for the years requested is as follows:

(In Million of Dollars)

	FY 1984	FY 1985	FY 1986	FY 1987

DELETED

Intelligence Coordination

Question: Please describe the coordination role of the office with regard to an intelligence gathering capabilities of the Department.

Answer: The Department of Energy has no independent role in the collection of foreign intelligence. That activity is performed by other members of the Intelligence Community. My office does coordinate the intelligence analysis activities within the Department and coordinates all Intelligence Community activities at the Department of Energy National Laboratories.

Verification and Control Technology Personnel

Question: How many people are employed in this function in FY 1984, FY 1985, FY 1986, and FY 1987?

Answer: The Verification and Control Technology program is managed by the Office of International Security Affairs under the Deputy Assistant Secretary for Security Affairs and by the Deputy Assistant Secretary for Intelligence. The personnel strengths for FY 1984 through FY 1987 are 60, 64, 66, and 66.

Question: Please describe the relationship of the analysis of nuclear terrorism intelligence performed in safeguards and security.

Answer: Nuclear terrorism intelligence analysis conducted within the Office of the Deputy Assistant Secretary for Intelligence supports security policies and procedures developed and instituted by the Office of Safeguards and Security to protect DOE installations, activities, property, information, and employees. Foreign intelligence received by DOE from any source, is factored as appropriate into intelligence analysis of nuclear terrorism. This analysis in turn is considered in determining the overall potential threat from terrorists, and managing the risk to DOE facilities. This is a matter of extremely high DOE priority.

Detection Activities

Question: Please describe the improvements in detection activities and the need to replace outdated systems.

Answer: The detection technology development activity in the Verification and Control Technology (V&CT) program is an ongoing effort to develop, update, and maintain state-of-the-art technology in the arms control and treaty verification arenas. Further, by the pursuit of advanced technical concepts, we try to anticipate future requirements in order to be time and subject responsive to arms control, verification, DELETED

There are several examples of improvements in detection capabilities and replacement of outdated systems evidenced in this program. First, nearly a decade ago, DOE developed the equipment for onsite inspection provisions under the Peaceful Nuclear Explosives Treaty (PNET) protocol. To a large measure, this equipment is no longer supportable. Modernization is currently underway to incorporate logistically supportable and reliable state-of-the-art technology into an improved Local Seismic Network, packaging and field deployment provisions, and fabrication of additional CORRTEX units to fulfill DOE PNET protocol responsibilities. Second, DOE's Regional Seismic Test Network (RSTN) began full operation in 1982 based on late 1970's technology for the National Seismic Stations. The technology was developed as essentially a prototype capability for an in-country seismic system during negotiations for a Comprehensive Test Ban Treaty. The technical objectives for the RSTN have been adequately met and the engineering experience gained during the RSTN's operation will be used in designing the deployable seismic verification system (DSVS). In FY 1987, efforts will be focused on the design and system specification of a DSVS for use in in-country regional seismic monitoring.

DELETED

Question: How many satellite-borne sensors were delivered in FY 1985 and planned for FY 1986 and FY 1987?

Answer:

DELETED

CONCLUSION OF HEARINGS

Chairman HATFIELD. Thank you, gentlemen. We will stand adjourned subject to call.

[Whereupon, at 4:15 p.m. Wednesday, April 23, the hearings were concluded and the subcommittee was recessed to reconvene at the call of the Chair.]

LIST OF WITNESSES, COMMUNICATIONS, AND PREPARED STATEMENTS

Page

Abrahamson, Lt. Gen. James A., U.S. Air Force, Director, Strategic Defense Initiative Organization ... 1223, 1281
  Prepared statement ... 1296
Bradley, George J., Jr., Acting Assistant Secretary for International Affairs and Energy Emergencies, Department of Energy, prepared statement ... 625
Clagett, William H., Administrator, Western Area Power Administration ... 1147
  Prepared statement ... 1149
Cross, Robert J., Administrator, Alaska Power Administration ... 1137
  Biographical sketch ... 1143
  Prepared statement ... 1139
Davis, Brig. Gen. Sidney, U.S. Army, Acting Assistant to the Secretary for Defense (Atomic Energy) ... 1223, 1234
  Prepared statement ... 1243
Elferink, JoAnn, Acting Director, Office of Policy, Planning and Analysis, Department of Energy, prepared statement ... 618
Farrell, J. Michael, General Counsel, Department of Energy, prepared statement ... 635
Fitzpatrick, Donna R., Assistant Secretary for Conservation and Renewable Energy, Department of Energy ... 675, 1051
  Biographical sketch ... 695
  Prepared statement ... 678
Flowers, Geraldine P., Deputy Director, Office of Minority Economic Impact, Department of Energy:
  Biographical sketch ... 623
  Prepared statement ... 620
Foley, Sylvester J., Jr., Assistant Secretary of Energy for Defense Program ... 1223
  Prepared statement ... 1229
Garrish, Theodore J., Assistant Secretary, Congressional, Intergovernmental, and Public Affairs, Department of Energy, prepared statement ... 623
Geisinger, Harry C., Administrator, Southeastern Power Administration ... 1102
  Biographical sketch ... 1113
  Prepared statement ... 1104
Herrington, John S., Secretary of Energy ... 583
  Biographical sketch ... 600
  Letter from ... 740
  Prepared statement ... 586
Hesse, Martha O., Assistant Secretary, Management and Administration, Department of Energy ... 583
  Prepared statement ... 613
Johnson, Peter T., Administrator, Bonneville Power Administration ... 1059
  Biographical sketch ... 1070
  Prepared statement ... 1061
Layton, John C., Inspector General, Department of Energy, prepared statement ... 616
Longenecker, John R., Deputy Assistant Secretary for Uranium Enrichment, Department of Energy ... 901
  Biographical sketch ... 966

Page
Mattingly, Hon. Mack, U.S. Senator from Georgia, prepared statements 601, 1146
McKee, Adm. Kinnaird R., U.S. Navy, Director, Naval Nuclear Propulsion Program 1197
Prepared statement 1206
Rusche, Ben C., Director, Office of Civilian Radioactive Waste Management, Department of Energy 901
Prepared statement 967
Trivelpiece, Dr. Alvin W., Director, Office of Energy Research, Department of Energy 737
Prepared statement 742
Vaughan, James W., Jr., Acting Assistant Secretary for Nuclear Energy, Department of Energy 901
Biographical sketch 965
Prepared statement 910
Voight, William R., Jr., Director, Office of Remedial Action and Waste Technology, Department of Energy 901
Walker, Mary L., Assistant Secretary for Environment, Safety, and Health, Department of Energy 823
Biographical sketch 833
Prepared statement 824
Wilcox, Dr. Lyle C., Deputy Assistant Secretary for Reactor Systems, Development, and Technology, Department of Energy 901
Wilkerson, Ronald H., Administrator, Southwestern Power Administration 1117
Biographical sketch 1124
Prepared statement 1119

SUBJECT INDEX

DEPARTMENT OF ENERGY

ATOMIC ENERGY DEFENSE ACTIVITIES

Page
Antisubmarine 1331
Budget request:
  Detail of 1225
  Fiscal year 1987 1223
Comprehensive test ban 1308
  Verification 1309
Defense program:
  Management strategy 1227
  Priorities 1224
Defense waste processing facility 1365
Demolition munitions 1330
Detection activities 1374
DOE waste inventory 1368
Employment levels 1346
Environmental problems, funding for 1288
Environmental project funding 1350
Fernald environmental funding 1343
Gramm-Rudman reductions, impact of 1226, 1235
Hanford waste disposal 1370
High-level waste tanks 1367
Idaho calcined solids storage 1370
Inertial confinement fusion 1336
Inflation allowance 1372
Laboratory manpower levels 1239
Material production requirements 1236
N reactor, extend life of 1345
Nuclear materials production:
  Analysis of supporting services 1355
  Funding by location 1357
  Processing of 1353
Nuclear weapons:
  Benefits of testing 1240
  Necessity for testing 1237
Process facility modifications 1348
Reactor operations 1351
Reactors on tritium, number of 1345
Reprogrammings 1362
Research programs to improve production 1344
Savannah River:
  Construction of cooling lake at 1341
  Cooling towers at 1341
  Environmental damage at 1342
  Production reactors at 1340
  Thermal discharge off Savannah River site 1341
  Thermal mitigation project at 1361
Shuttle disaster 1372
Special isotope separation 1285, 1346

Page
Special nuclear materials, report on 1349
Standard missile–2 1330
Strategic Defense Initiative 1281, 1333
  Concepts 1290
  EIRS Program 1302
  Fiscal year 1986 supplemental for SDI 1303
  Funding at the national laboratories 1293
  Objectives of 1281
  Nuclear-directed energy weapons 1294
  Policy 1293
  Requirement for supplemental funding 1306
  SDI as a nonnuclear option 1302
  Soviet capabilities 1294
  Work at the national laboratories 1283
Supplemental request 1338
Test moratorium, impact of a 1241
Testing:
  Future 1314
  Other limitations 1310
  Purpose of 1311
Threshold Treaty, compliance with 1307
Uranium enriching 1348
Verification and control technology:
  Funding 1372
  Personnel 1373
Waste isolation pilot plant 1364
Waste Transfer Program 1366
Weapons activities 1315
  Summary of restoration, revitalization, and prevention of plant deterioration (table) 1323

ENERGY RESEARCH

Budget highlights 737
Deferrals, proposed for 1986 816
Educational investment in the future 740
Fuel cells 817
Funding possibilities, fiscal year 1987 812
Fusion Energy Program 739
High energy physics 737
High energy technology R&D 813
Magnetic fusion 818
Nuclear physics 738
Price-Anderson indemnification extension 820
Project review process 811
Superconducting super collider 810, 818
  Siting 814

ENVIRONMENT, SAFETY, AND HEALTH

Applied mathematical sciences 855
Basic energy sciences 849, 878
Biological and environmental research 866
Budget request 823
Chemical sciences operating expenses (table) 853
Cogeneration 883
Construction and major equipment funding (table) 838
Continuous electron beam accelerator facility 847
Energy storage 898
Environmental audit and compliance 868
High energy physics 835

Page
International cooperation on physics accelerators 888
Magnetic fusion 856, 896
Mendez Foundation 877
Multiprogram facilities support 864
Nuclear:
  Physics 842
  Sciences 854
Photovoltaics 882
Physics facilities:
  Cost of 892
  Utilization of 890
Solar building energy systems 880
Solar energy overview 879
Solar thermal 884
Superconducting super collider 839, 885, 898
University research support 861

NAVAL NUCLEAR PROPULSION PROGRAM

Acoustic performance 1203
Advanced reactor concepts 1200
Attack submarine, new 1201, 1217
Light Water Breeder Program 1201
Moored training ship demonstration 1201
Naval:
  Fuel factory 1217
  Nuclear propulsion work 1200
  Reactors development budget 1218
Program:
  Performance 1205
  Statistics 1199
Reactor:
  Plant disposal 1220
  Safety 1198
Responsibilities 1198
Shipbuilding status 1218
SSN-21:
  Improvements 1202
  Status 1204
Submarine:
  Capabilities 1217
  Detection 1204
Water Cooled Breeder Program 1221

NUCLEAR FISSION R&D, URANIUM ENRICHMENT, AND NUCLEAR WASTE DISPOSAL PROGRAMS

Advanced enrichment technology 906
Advanced reactor:
  Concepts 904
  R&D 999
Budget formulation criteria 902
Civilian Radioactive Waste Management Program 907
Civilian waste R&D 1029
First repository site selection process 1044
Geologic siting 1043
Hanford site:
  NRC report on 992
  Oregon-Washington cooperation in review of 992
High temperature gas reactor 1001

Page
Light water reactors 776
  Research 903
Liquid metal reactor 1002
Low-level waste 988, 1040
Measuring ground water properties 986
Monitored retrievable storage 908
MRS proposal, timing of 988
Nuclear energy:
  Research and development 903
  Summary of budget 902
Nuclear:
  Fission 1038
  Safety and licensing 989
  Waste 1030, 1032
  Waste fund activities 907, 1031
Program direction 1011
Public hearing process 985
Reduced enrichment research and test reactors 1006
Remedial action 905
Second nuclear waste repository 984
Second repository site selection process 1043
Space and defense power systems 904, 1007
Subseabed disposal 987, 1047
Uranium enrichment 903, 989, 1047
  Bilateral talks 988
Waste fund receipts 909
West Valley 1022

OFFICE OF THE SECRETARY

Atomic energy defense activities 602
Bonneville Power Administration 606
Budget summary 584
Clean Coal Technology Program 608
Clean coal proposal selection 610
Congressional, intergovernmental, and public affairs 660
Contractor at Los Alamos, change of 608
Cooperative research and development efforts 585
Energy conservation 670
Funding request 639
International affairs 661
Magnetic fusion, funding for 645
Management and administration 652
Military versus civilian research 603
Minority Honors Training Program 655
Mod-5B wind turbine, funding deferral for 651
1985 farm bill amendment 601
Nuclear energy 644, 664
  Research 603
Office of Minority Economic Impact 640
Operations offices 653
Power marketing administrations 605, 667
Privatization proposal 584
Shift of nuclear activities to Defense 604
Solar:
  Power 668
  Research 669
  Program 669
Strategic defense initiative 642
Waste isolation pilot plant 606

POWER MARKETING ADMINISTRATIONS

Page
Defederalization of PMA's ... 1052, 1053, 1054, 1058, 1191
  Impact on irrigation activities ... 1056
Electric rates, increased ... 1055, 1057
Marketing preference ... 1055
Repayment proposal ... 1052
WAPA marketing of surplus power ... 1056

ALASKA POWER ADMINISTRATION

Budget proposal ... 1137
Net billing process ... 1137
Sale of Alaska Power Administration ... 1144

BONNEVILLE POWER ADMINISTRATION

British Columbia:
  Future power investments ... 1072
  Hydropower sales ... 1071
  Power exports ... 1073
Conservation ... 1079
Financial status ... 1059
Fish and wildlife ... 1083
Hydro options ... 1086
Load forecasting ... 1085
Marketing cooperation ... 1074
New resource ... 1100
Procurement restrictions ... 1088
Site C resource development ... 1073
Transmission ... 1081
WPPSS—Supply system ... 1076

SOUTHEASTERN POWER ADMINISTRATION

Power marketing policies ... 1102
Repayment reform ... 1114
Repayment status and budget request ... 1102

SOUTHWESTERN POWER ADMINISTRATION

Budget request for 1987 ... 1117
Harry S. Truman Dam, MO ... 1125, 1129
Procurement restrictions ... 1132
Purchase power ... 1128
Repayment status ... 1117, 1131
Sale of excess property ... 1125
Transmission studies ... 1130

WESTERN AREA POWER ADMINISTRATION

Basin Electric Power Cooperative ... 1188
Buy America ... 1178
California-Oregon transmission project ... 1169
Construction and O&M programs ... 1148
Construction and rehabilitation ... 1175
EHV equipment ... 1189
Fiscal year 1987 program initiatives ... 1167
Hoover power rates ... 1191
Kansas transmission study ... 1173
Manitoba hydro project ... 1166, 1170
Mead-Northwest DC intertie ... 1175

Page
Present and projected power rates (table) ... 1168
Procurement restrictions ... 1179
Purchase power and wheeling ... 1147, 1177
Rates and repayment ... 1148
Third ac transmission line ... 1147
Western Colorado transmission facilities ... 1147

SOLAR AND RENEWABLE ENERGY PROGRAMS

Biofuels ... 699
Budget request, summary of ... 676
Building systems ... 709
Complex carbohydrates, study of ... 734
Cooperative research and development ventures ... 697
Electric energy systems ... 715
Energy storage ... 724
Geothermal:
    Loan guaranty program ... 713
    R&D ... 712
Hawaiian deep water cable project ... 723
International solar ... 710
Photovoltaics ... 701
Program direction ... 711
Renewable energy:
    Budget history (ERDA and DOE) ... 713
    Government's role in ... 696
Renewables, contribution of ... 696
SERI ... 710
Solar and renewables funding request ... 697
Solar thermal ... 706
Tax credit issue ... 697
Technology transfer ... 710
Wind energy ... 703